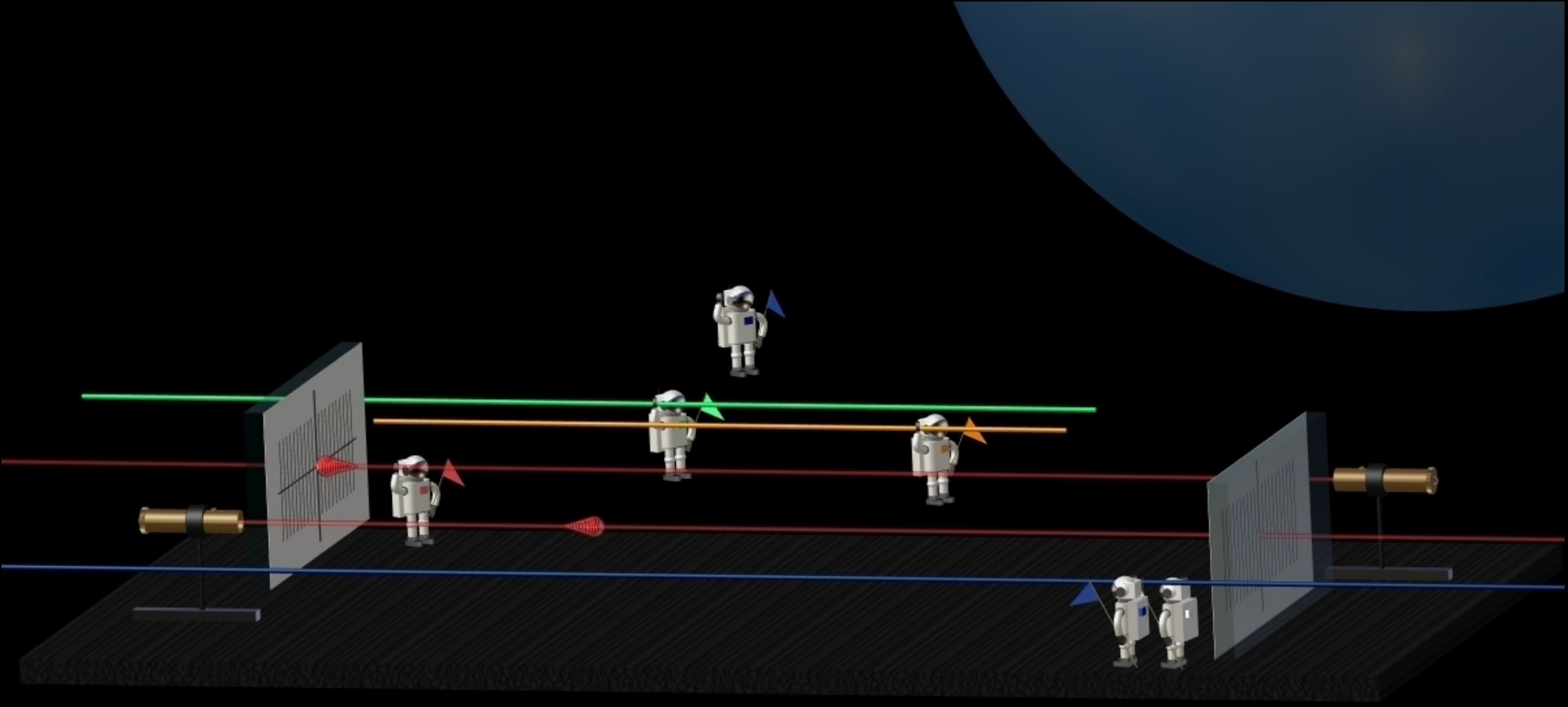
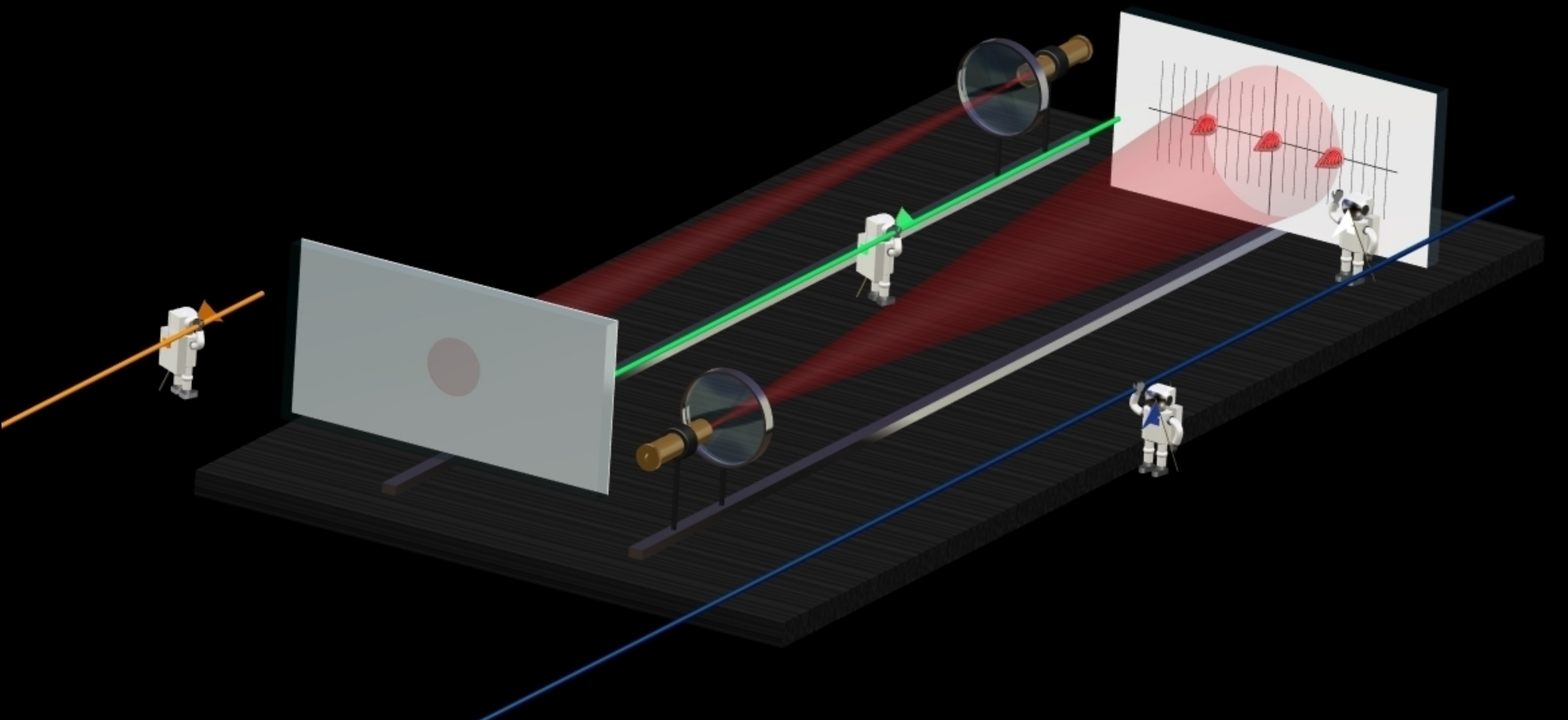


EXPERIMENT-C



This book describes the spatio-optical phenomenon in motion. Independent methods that allow to discover and precisely define absolute vehicle velocity have been presented. The „true" nature of time was discovered and described.

"Experiment-L" is a second part of book "Experiment-C" !!!

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Translator: Lech Dziułka

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Author's note.

If an error is detected in any well-established theory, such error should be corrected. If several errors are detected, they should be corrected all the more. But what happens if the entire well-established theory is erroneous? Should it be replaced by a new corrected theory? The answer to this question seems to be obvious. Yes, it should be. It should be done as soon as possible. The choice appears to be straightforward.

Let's make the problem as difficult as possible, up to the limits of absurd. What should be done if the considered theory is one of the most important theories in the entire Physics? It is regarded as true by all scientists, well, almost all of them. It's confirmed experimentally and by plenty of publications of various authors. Even authors of SF (Science Fiction) books write about it. I am talking about the Special Theory of Relativity by Albert Einstein. What should be done in such case? If errors are discovered in such theory, should one expose oneself to criticism and try to explain them? Is it necessary to act contrary to the view held by the most eminent scientists? Are these the limits of absurd or pure stupidity? Is it an impossible, unfeasible task? What should be done in such situation?

Answer 1.

No, such significant and well-known theory should not be changed because all people are well accustomed to it. Why should I cause their brains to reel? Let them live and duplicate the errors.

Answer 2.

Yes, the erroneous theory should be corrected. The occurring errors should be exposed even if one exposes himself to any trouble. Development of science requires that discoverer should share their knowledge with others. If the new theory will be accepted by others, fine, if not – it can't be helped. Everyone has their own mind and opinions. Everyone can make their choice between the new and current theories. Learning something new will not cause any harm. The new theory can always be considered as an alternative to the currently established one.

I, Grzegorz Ileczko, have selected answer 2. The consequence of my choice is precisely this book.

Introduction.

This book is composed of two parts:

– Part 1 **Experiment – C** **(Absolute velocity of vehicle)**
– Part 2 **Experiment – L** **(Absolute Time)**

This book deals with some Theory of Relativity issues in a non-standard generally accepted way. In principle it is a concept of physics without relativism. Generally speaking both parts of the book are based on no assumptions whatsoever. The entire book is based on a well known and founded laws of physics, in particular on the ***„free space loss"*** law. A detailed analysis of optical phenomena that occur in space for high vehicle velocities forms the basis for better understanding of the time and space real nature. One can say briefly that the material compiled and described in this publication pertains to several problems:

– Clarification of deficiencies of the Special Theory of Relativity,
– The phenomenon of ***„free space loss"*** for very fast vehicles,
– Geometry of optical beams on-board a very fast vehicle,
– Two independent equations determining vehicle's absolute velocity,
– Modernisation of a theoretical experiment with a light clock (this is a clock composed of two mirrors and a photon),
– The real nature of time. A mathematical proof that time has absolute nature – it is invariable.

All the experiments shown in this book refer, more or less, to the postulates comprised in the Albert Einstein's Theory of Relativity.

The main postulates of the Theory of Relativity have been presented here below in an abbreviated form:

1.) The central paradox is that the speed of light must be the same for all observers irrespectively of their velocity and the source of light velocity. Light speed is always constant and it is $c = 2{,}998 \cdot 10^8 \dfrac{m}{s}$.

2.) Space shrinks, in the direction of movement, by $\sqrt{1-\dfrac{v^2}{c^2}}$ factor, whereas time slows down by $\gamma = \dfrac{1}{\sqrt{1-\dfrac{v^2}{c^2}}}$ factor.

3.) There is no method for determination of vehicle's absolute velocity. There are no physical experiments that could be performed inside the vehicle to determine it's speed assuming total absence of vehicle's interior contact with the external world.

Experiment – L Pertains mainly to the first and second postulate.

Experiment – C Pertains mainly to the first and third postulate.

Experiment – C (Part 1)

In the first part of the book two experiments allowing to find and precisely define vehicle's absolute velocity have been described. The assumption of total lack of contact between the vehicle interior and the external world has been complied with in both cases. According to the Theory of Relativity such experiment does not exist and vehicle's absolute velocity cannot be determined.

Division of experiment – C into two parts facilitates its easier presentation and understanding. The first part has the same name. The second part illustrates Experiment – cosine C. Both parts are strongly bound.

Both experiments resulted in provision of new knowledge on deficiency of the postulates contained in the Theory of Relativity. Explanations of this "error" was a serious challenge for me because it has appeared that this could be accomplished. The explanation should be clear and precise.

Transparency of the proposed idea could have been achieved by application of proper computer animations, drawings and relevant verbal descriptions.

Precision of argumentation could have been assured only by application of mathematical (physical) equations and their numerical analysis.

Experiment – L (Part 2)

In the second part of the book Experiment – L has been described. It makes a modified version of a well known experiment with the light clock. This experiment has been improved compared with the original one. The optical clock was substituted by a laser. Laser beam can leave laser's interior, therefore, it becomes observable (not only in theory). Experiment – L has been designed as a "broad" angular analysis. Various laser positions onboard the vehicle were accurately studied. One can literally say that laser beam has been analysed at every angle. This resulted in new knowledge on deficiency of the gamma factor (Theory of Relativity).

Whether the presented results of all experiments are correct or not, this is for the reader to assess. I cannot, and even don't want, to decide it single-handed. However, I can present my own ideas and my own point of view. Let it be a theory that is alternative to the ruling Theory of Relativity.

N.B. Numbering of all drawing, computer animation, mathematical equation and characteristic markings has been introduced at this point from the very beginning. This is so because Experiment–L can be analysed and presented independently from the other experiments.

Technical information:

This book contains a high number of drawings and animations. The animations facilitate greatly understanding of the presented problems. They were compressed with a strong H.264 video codec. Proper video codecs should be installed in your computer's operating system so that the animations can properly operate. One of several exemplary video codec packs should suffice to properly play the animations:

FFDShow,

K-Lite Codec Pack,

Win7codecs

I use the last one. You should have also correct PDF file reader. Any alternative PDF file readers do not cope properly with animation playing. You should install a free Adobe software in your operating system. The Adobe Reader XI ensures faultless operation of the presented document. All the above-named applications can be downloaded free from the Web and installed in your computer's operating system.

Animations are also available on the website: www.gibook.eu

Experiment – C

Part 1

1. Experiment – C.

Experiment – C has been devised in such way so that the simplest situation be presented at the beginning. Sections (1.1) and (1.2) are aimed at visual presentation of the described problem. The reader has an opportunity to watch the computer animations contained in those sections. This helps with the visualisation of the described spatial and optical phenomena, because they do not belong to obvious phenomena at all. Not everyone has a sense of spatial visualisation. Even fewer people can animate any spatial occurrences in their imagination. The proper experiment starts at section (1.2). Both the vehicle and photons have been presented here in motion. At this point there appear discrepancies, an attempt to explain these constitutes the essence of the experiment. Section (1.1) has been added for completeness. It is simple and evident, despite of that I encourage the reader to not ignore its content. This section is short and makes a proper plane of reference for section (1.2).

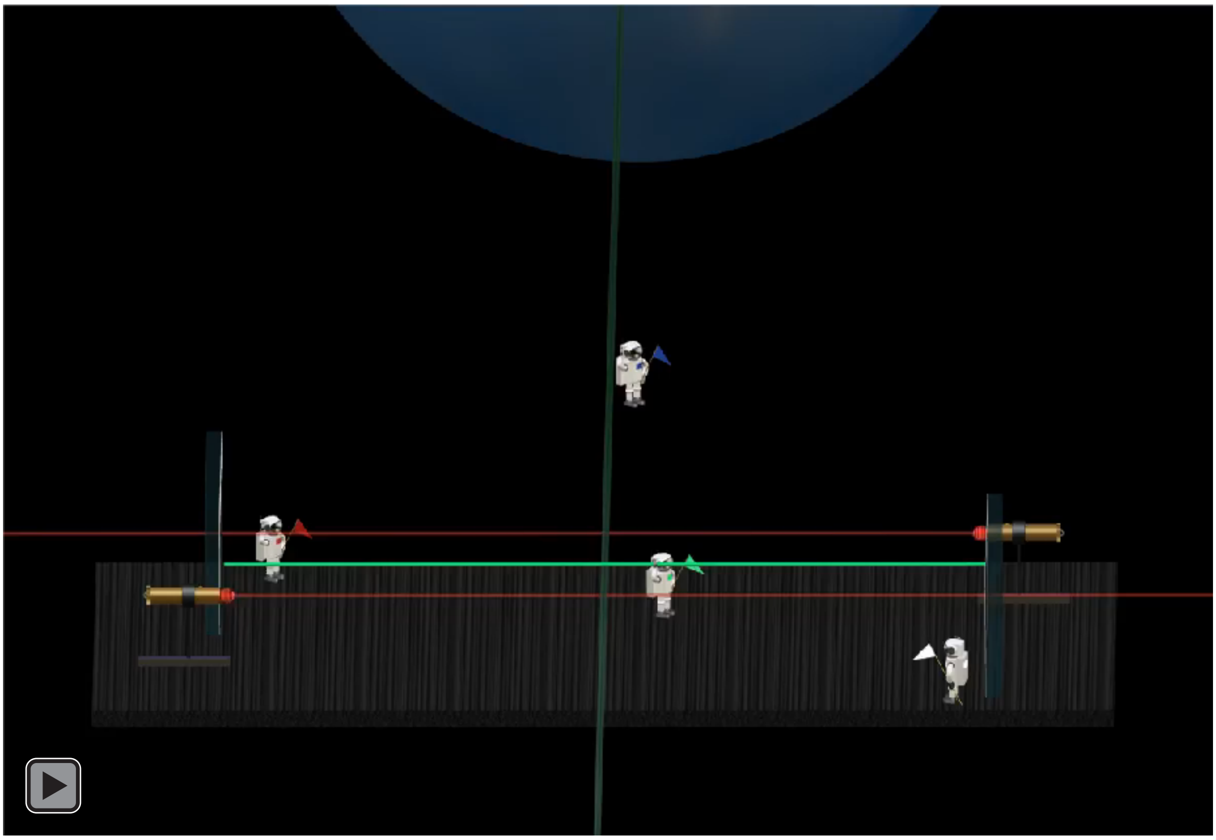
Section (1.3) requires careful consideration as it presents mathematical analysis. Briefly, equations that are essential to describe the earlier presented physical phenomena have been put therein. Section (1.3.3) is the most innovative and, at the same time, culminating one. It shows how vehicle's absolute velocity can be determined. According to the Theory of Relativity such method does not exists. So, the above section automatically becomes controversial. It is for the reader to asses if it is correct or true.

The numerical (computer) analysis of the equations obtained earlier has been placed in section (1.4). Substitution of proper numerical values allows for solving of relevant equations and for presentation of the results in graphical form. Such method of presentation provides grounds for full understanding of the described phenomena. It is also precise and clear. The phenomena presented in the experiment are relativistic in nature. Comparison of the results of the experiment with Albert Einstein's Theory of Relativity has been presented in section (1.5). This juxtaposition forms a basis for formulation of surprising conclusions. These constitute the final section marked as (1.6).

The experimental conditions are approximately the same for all subsections. Vehicle velocity always has constant value ($v=0.9C$). Only during the numerical analysis as a function of vehicle velocity, the velocity is changed incrementally. The vehicle has zero acceleration at the moment of taking the measurement (analysis performance). The adopted measurement distance is ($L=10m$). This is the distance from the source of light (laser) to the measuring target.

1.1 Visual analysis of photons in a laser beam. Stationary vehicle.

Animation – you should click on the animation area.



Anim.1. Stationary vehicle. Each photon reaches its respective measuring target at the same moment.

The experiment is performed in outer space. You can see a planet in the background. Somebody emits a green laser beam from the planet. Luckily it so happens so that the beam runs precisely through the centre of the vehicle's deck. It makes a kind of reference line. The vehicle's deck can be treated as a measuring bench. In this specific case it's velocity is (v=0m/s). The vehicle is open so that there be an opportunity to observe the experiment. There are several optical measuring instruments on-board. These are lasers, semi-transparent measuring targets, a green measuring bar featuring length of (L=10m). There are also a few astronauts/observers there. Each of them holds a flag in different colour and has a sticker attached to his spacesuit. We can name them, shortly, as green, red, blue etc. Once the animation is activated, photons scurrying in opposite directions with C velocity should be seen. The animation is, of course, appropriately slowed down so that effortless observation can be possible. Both photons cover the same distance (L=10m) at the same time. All the astronauts observe that. One of them is measuring time, which coincides with the calculation presented below.

The subsequent animations have been described with lesser detail. Only the essence of the phenomenon has been presented carefully.

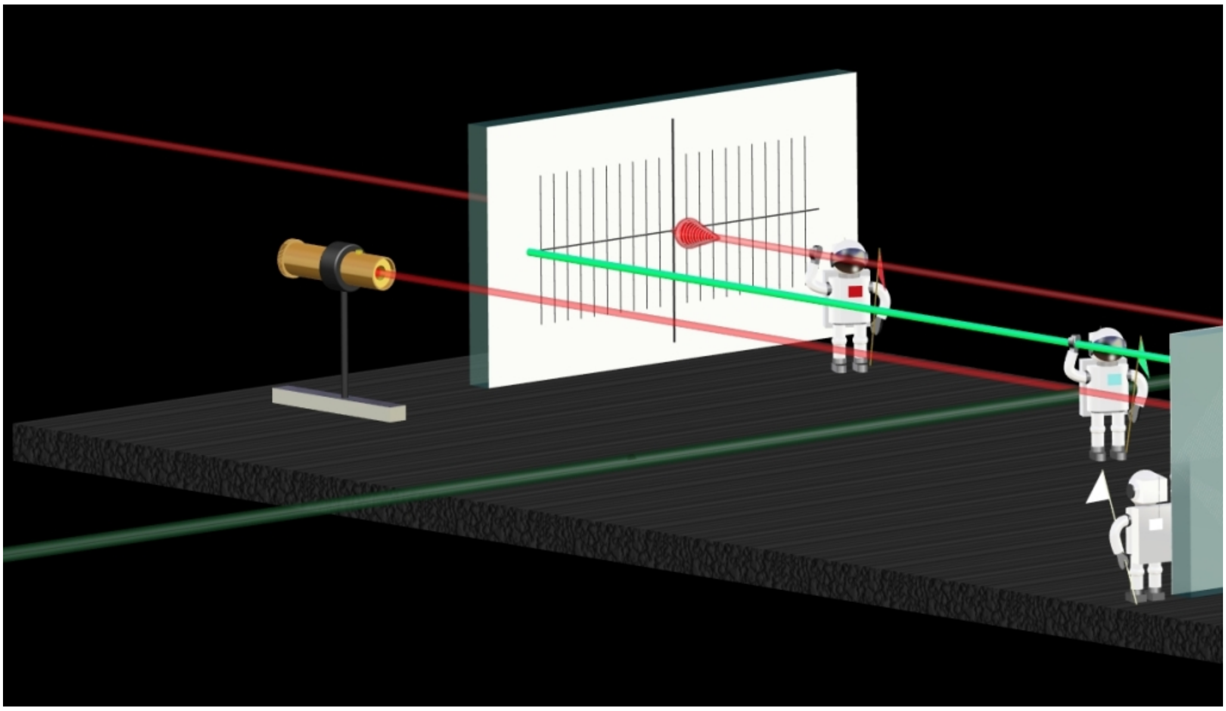


Photo 1. Laser and measuring target close-up. A photon hitting the target is visible.

The time after which the photon arrives at the measuring target has been calculated below. The time of contact with relevant targets is identical for both photons (Anim.1).

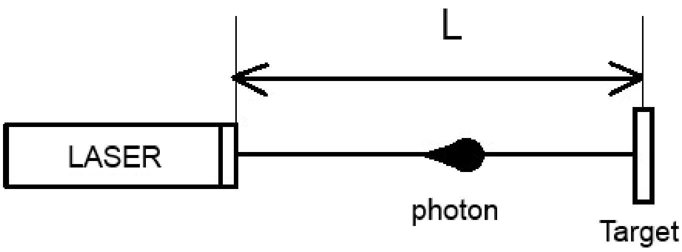


Fig. 1. Photon is heading towards the measuring target.

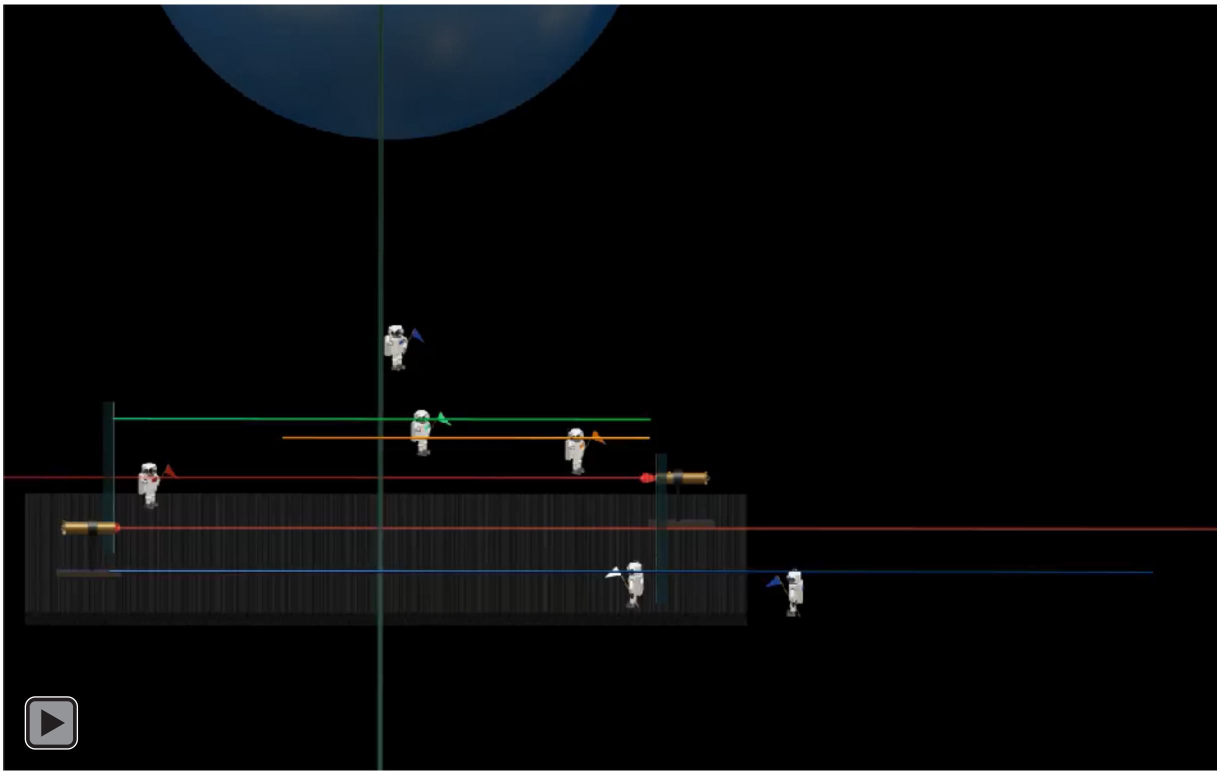
$$c = \frac{L}{t} \rightarrow t = \frac{L}{c}$$

Time after which the photon arrives at the measuring target:

$$t = \frac{10m}{c} = \frac{10m}{2{,}998 \cdot 10^{8}\,\frac{m}{s}} = 3{,}336 \cdot 10^{-8}\,s$$

1.2 Visual analysis of photons in a laser beam. Moving vehicle.

Animation – you should click on the animation area.



Anim.2. Vehicle in motion (v=0.9C). Each photon reaches it's respective measuring target at a different moment.

The vehicle velocity has been fixed and it is (v=0.9C). The animation parameters have been so selected that the vehicle actually moves with velocity factor of (0.9) in relation to the photons. The green bar determines the measuring distance on-board the moving vehicle. This is being measured by the astronauts/voyagers. The distance features exactly the same length as in the previous section, i.e. (L=10m). The yellow measuring bar is shorter then the green one. It is equivalent to the distance that will be covered by the photon moving in the direction opposite to the vehicle movement. This happens because the measuring target, which the photon hits, will move toward it before the photon manages to cover the distance determined by the green bar. Briefly, the target "rushes" to meet the photon. The situation of the other photon, which flies in the same direction as the vehicle, is different. That photon "is chasing" the measuring target, which "runs away" from it. The distance that this photon will cover has been measured by the "blue" astronaut holding a blue bar in his hand.

The first photon arrives at the target like a winner. It is clearly visible that the second photon has covered the same distance as the first one, however, it failed to reach its target yet. The whole action is carefully watched by static observers who have found that both photons scurry at the speed of light C. The observers located on-board of the vehicle cannot understand why they have measured different times for the photons arriving at relevant measuring targets. Assumption of the total lack of contact between the vehicle interior and external world should be remembered. From the voyagers point of view, the measured photon durations should be the same, yet they are different.

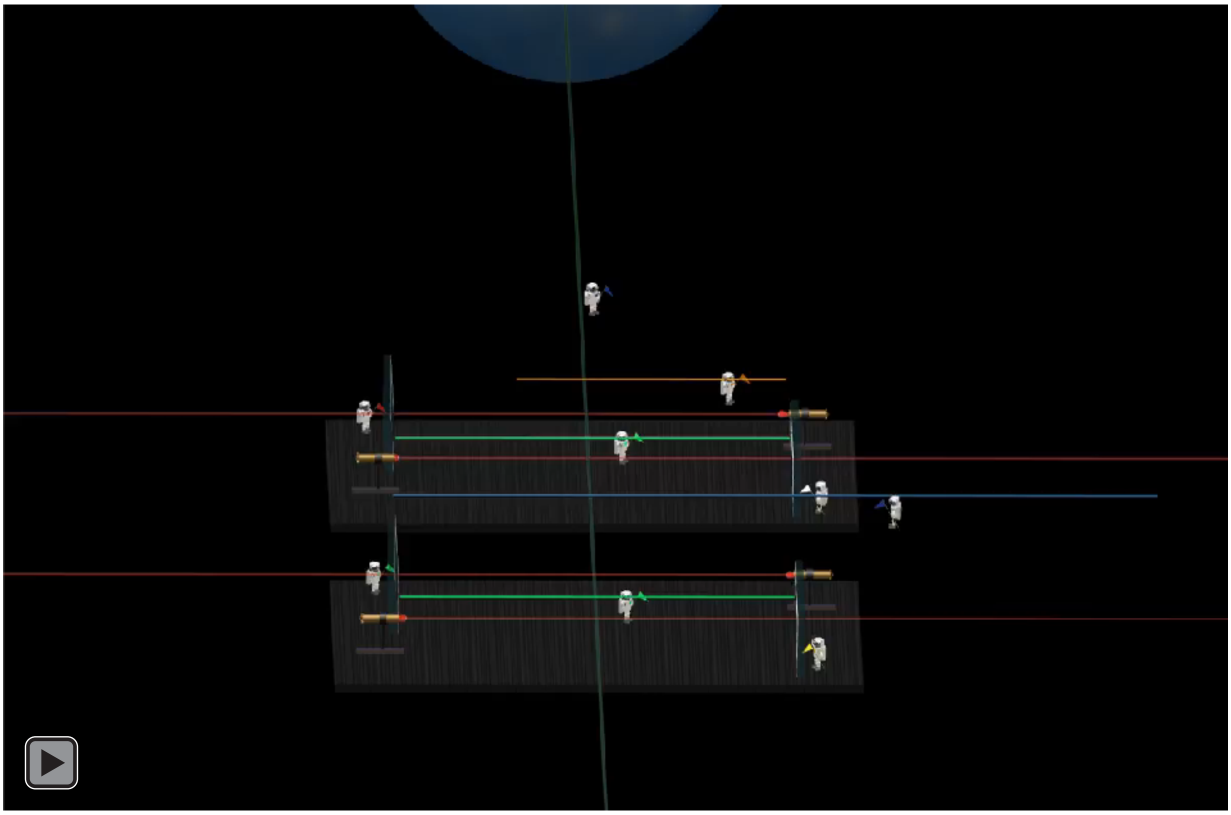
The measuring distance (L) between the laser and the target is identical for both laser-target optical systems. This is independent of the vehicle (measuring bench) dimensions. It is irrelevant whether the bench has a "normal" length or was subjected to relativistic shortening. Irrespectively of the actual L length (green bar) the photons will arrive at their respective measuring targets at different moments.

The Theory of Relativity maintains that the laws of physics must be invariable even for quickly moving objects. So, a strange anomaly has appeared here. It is difficult to describe it in few sentences. I will show you step by step why this is so.

The situation is similar to that from the film "Matrix". Unfortunately, it is impossible to explain to anyone what is "Matrix", one should find it out oneself.

"A picture is a poem without words." **Horace**

The comparison of a moving and stationary vehicles.



Anim.3. Comparison of the moving and stationary vehicles.

The comparison of a moving and stationary vehicles provides a good illustration of the problem. All photons have the same velocity equal to C. The photons move independently of the vehicle. One can vividly say that "they are not interested" in the environment.

The sequence of events is of paramount importance. The photons were generated at the same moment. The photon moving in the direction opposite to that of the moving vehicle arrived at his target first. Then, two photons of the stationary vehicle arrived at their respective targets. They did it at the same time. The photon moving in the same direction as the moving vehicle arrived at its respective target last.

The photons arrive at their respective measuring targets at different moments, even if the relativistic shortening effect of the moving vehicle is taken into account. To explain the above-presented situation in a more clear way it is essential to present it in mathematical form.

1.3 Mathematical analysis.

Two cases have been described separately. Both form a basis for derivation of the vehicle absolute velocity equation.

- Photon direction is the same as the moving vehicle direction. The photon chases the target.
- Photon direction is opposite to that of the moving vehicle. The target rushes to meet the photon.

1.3.1 Photon's direction of motion is the same as that of the vehicle. Photon chases the target.

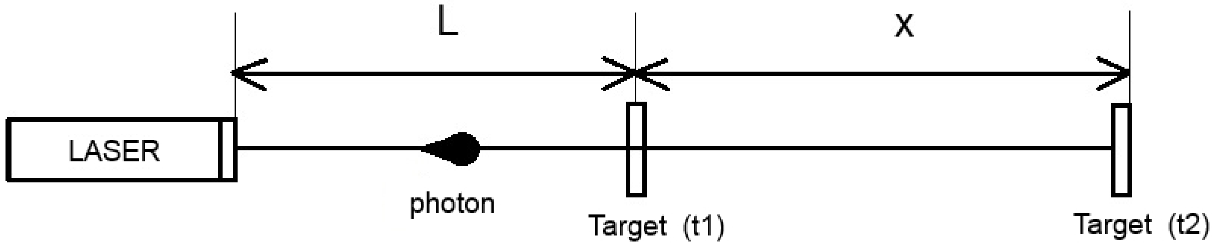


Fig. 2. Photon chases the target.

The photon leaves the laser and chases the fleeing target with velocity of C. It will catch up with the target when the latter will be located at position (t2). So, the photon will cover the distance of (L+x). The target will cover, at that time, distance (x) from its initial position at moment (t1) to its final position at moment (t2). The vehicle and the measuring target have velocity lower than C (v < C). It is possible to determine the time after which the photon arrives at the measuring target.

$c = \frac{L+x}{t_1} \rightarrow t_1 = \frac{L+x}{c}$ (1) time after which the photon hits the target (equation for photon)

$v = \frac{x}{t_2} \rightarrow t_2 = \frac{x}{v}$ (2) time after which the photon hits the target (equation for target)

Times t_1 and t_2 can be equated because both are identical. In such way distance (x) can be determined. Equation transformations have been shown in relevant sequence so that the course of action can be followed.

$$t_1 = t_2$$

$$\frac{L+x}{c} = \frac{x}{v}$$

$$L + x = \left(\frac{c}{v}\right)x$$

$$L = \left(\frac{c}{v}\right)x - x$$

$$L = \left(\frac{c}{v} - 1\right)x$$

$$x = \frac{L}{\left(\frac{c}{v} - 1\right)}$$

The calculated distance (x) is slightly flawed. If (v=0 m/s) division by zero would occur, therefore, this mathematical goblin should be eliminated.

$$x = \frac{L}{\left(\frac{c}{v} - 1\right)} = \frac{L}{\frac{c}{v}\left(1 - \frac{v}{c}\right)} = \frac{vL}{c\left(1 - \frac{v}{c}\right)} = \frac{vL}{c - v}$$

$x = \frac{vL}{c - v}$ (3) distance (x)

The time equation.

The situation looks as follows: distance (x) and length (L) are known. Therefore, formula (1) can be made independent of variable (x). Formula (2) has also been subjected to this operation.

$t_1 = \frac{L + x}{c}$ (1)

$$t_1 = \frac{L + x}{c} = \frac{L + \frac{vL}{c - v}}{c} = \frac{\frac{L(c - v) + vL}{c - v}}{c} = \frac{Lc - vL + vL}{(c - v)c} = \frac{Lc}{(c - v)c} = \frac{L}{c - v}$$

$t_1 = \frac{L}{c - v}$ time after which the photon hits the target (equation for photon)

$t_2 = \frac{x}{v}$ (2) making equation independent of variable (x), (equation 3)

$$t_2 = \frac{x}{v} = \frac{\frac{vL}{c - v}}{v} = \frac{vL}{(c - v)v} = \frac{L}{c - v}$$

$t_2 = \frac{L}{c - v}$ time after which the photon hits the target (equation for target)

The time after which the photon catches up with the measuring target and covers distance (L+x) will take the form of equation (4).

$$t = t_1 = t_2 = \frac{L}{c - v}$$

$t = \frac{L}{c - v}$ (4) time after which the photon hits the target

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1.3.2 Photon's direction of motion is opposite to that of the vehicle. The target rushes to meet the photon.

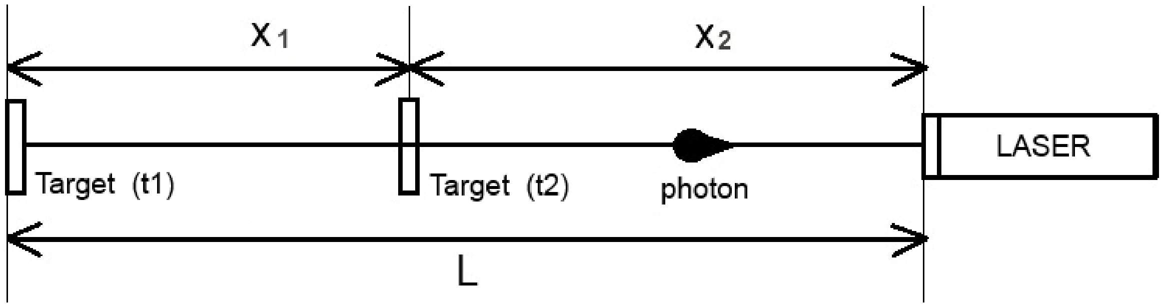


Fig. 3. Target rushes to meet the photon.

The photon leaves the laser and rushes to meet the target. Initially the photon intended to cover distance (L). However, the target rushes to meet the photon. Having seen what is going on the photon became aware of the fact that it would not cover distance (L), as previously planned. The distance (x_2), which the photon will cover, is shorter than (L). As the target moves with velocity lower than C (v < C), what is the value of distance (x_2) ? One of the astronauts observing the occurrence has made essential calculations.

The measuring distance (L), which determines the laser to target distance can be divided in two parts (x_1) and (x_2). The distance (x_2) will be covered by the photon with velocity C. The vehicle with the target will cover distance (x_1) with velocity (v).

$L = x_1 + x_2$ (5) distance (L)

$v = \frac{x_1}{t_1} \rightarrow t_1 = \frac{x_1}{v}$ (6) time after which the photon and the target will meet (for target)

$c = \frac{x_2}{t_2} \rightarrow t_2 = \frac{x_2}{c}$ (7) time after which the photon and the target will meet (for photon)

Times t_1 i t_2 can be equated because both are identical. In this way distances (x_1) and (x_2) can be determined. Relevant transformations have been shown below.

$$t_1 = t_2$$

$$\frac{x_1}{v} = \frac{x_2}{c}$$

$$x_1 = x_2\left(\frac{v}{c}\right)$$

$$L = x_1 + x_2 = x_2\left(\frac{v}{c}\right) + x_2 = x_2\left(\frac{v}{c} + 1\right)$$

$$x_2 = \frac{L}{\left(\frac{v}{c}+1\right)}$$ (8) distance (x_2)

$$x_1 = L - x_2$$

$$x_1 = L - \frac{L}{\left(\frac{v}{c}+1\right)}$$ (9) distance (x_1)

The time equation.

Equation (6) can be made independent of variable (x_1) and, likewise, equation (7) can be make independent of variable (x_2).

$$t_1 = \frac{x_1}{v}$$ (6) time after which the photon and the target will meet (for target)

$$t_1 = \frac{L - \frac{L}{\left(\frac{v}{c}+1\right)}}{v} = \frac{\frac{L\left(\frac{v}{c}+1\right) - L}{\left(\frac{v}{c}+1\right)}}{v} = \frac{L\left(\frac{v}{c}+1\right) - L}{\left(\frac{v}{c}+1\right)v} = \frac{L\frac{v}{c} + L - L}{\left(\frac{v}{c}+1\right)v} = \frac{L\frac{v}{c}}{\left(\frac{v}{c}+1\right)v} = \frac{L}{c\left(\frac{v}{c}+1\right)} = \frac{L}{v+c}$$

$$t_2 = \frac{x_2}{c}$$ (7) time after which the photon and the target will meet (for photon)

$$t_2 = \frac{\frac{L}{\left(\frac{v}{c}+1\right)}}{c} = \frac{L}{c\left(\frac{v}{c}+1\right)} = \frac{L}{v+c}$$

The equation of the time after which the photon would arrive at the target takes the form of (10).

$$t_{opp} = t_1 = t_2 = \frac{L}{v+c}$$

$$t_{opp} = \frac{L}{c+v}$$ (10) time after which the photon and the target will meet

The equations (3), (4), (8), (9) and (10) are used in the numerical analysis and in the subsequent parts of the book.

1.3.3 Vehicle’s absolute velocity. Time method.

“If at first the idea is not absurd, then there is no hope for it.”

Albert Einstein

To formulate an equation describing the absolute vehicle velocity, one should measure the duration of the light pulses. Light pulses generated at the same time by both lasers will arrive at their respective measuring targets at different times. The measurements for pulses moving in the same direction as that of the vehicle’s motion can be made by the “white” astronaut. The “red” astronaut measures the durations of those light pulses that move in the direction opposite to the vehicle’s motion. Knowing numerical values of both time measurements, both voyagers will determine the absolute velocity of their vehicle. They both know the form of equation (11), which has been presented below.

The equation describing vehicle’s absolute velocity can be obtained by comparing formulae (4) and (10). Some simple mathematical transformations should be performed in such way so that the vehicle velocity (v) would become the sought for function:

$$t = \frac{L}{c-v} \qquad (4) \qquad\qquad t_{opp} = \frac{L}{c+v} \qquad (10)$$

$$\frac{t}{t_{opp}} = \frac{\frac{L}{c-v}}{\frac{L}{c+v}} = \frac{L}{c-v} \cdot \frac{c+v}{L} = \frac{c+v}{c-v}$$

$$\frac{t}{t_{opp}}(c-v) = c+v$$

$$\frac{t}{t_{opp}}c - \frac{t}{t_{opp}}v = c+v$$

$$\frac{t}{t_{opp}}c - c = v\frac{t}{t_{opp}} + v$$

$$c\left(\frac{t}{t_{opp}} - 1\right) = v\left(\frac{t}{t_{opp}} + 1\right)$$

$$v_{abs} = c\frac{\left(\frac{t}{t_{opp}} - 1\right)}{\left(\frac{t}{t_{opp}} + 1\right)} \qquad (11)$$

(11) Vehicle’s absolute velocity. Time method.

The equation (11) has a very clear form. The speed of light C is evident and t and t_{opp} can be measured, therefore the determination of absolute vehicle velocity becomes possible.

1.4 Numerical analysis.

Numerical analysis of the experiment is based directly on the results of mathematical analysis. It has been performed for equations (3), (4), (8), (9) and (10). The analysis has been divided in two parts.

- Numerical analysis of equations for vehicle's constant velocity (v=0.9C).
- Numerical analysis of equations as a function of vehicle velocity.

The measuring distance is constant and it is (L=10m). Vehicle velocity is changed with a constant iteration step (for the second part of the analysis, of course). It is counted from (v=0m/s) to (v≈C). Vehicle's acceleration at the moment of taking measurements (analysis) is equal to zero. The analysis results have been presented as plots.

1.4.1 Numerical analysis of equations for vehicle's constant velocity (v=0.9C).

– Photon's direction of movement is the same as that of the vehicle's motion

$$x = \frac{vL}{c-v} = \frac{0{,}9c \cdot 10m}{c-0{,}9c} = 90m \qquad (3)$$

$$t = \frac{L}{c-v} = \frac{10m}{c-0{,}9c} = 3{,}336 \cdot 10^{-7} s \qquad (4)$$

Checking the distance covered by the photon in time t

$$c = \frac{S}{t} \rightarrow S = c \cdot t \qquad S = 2{,}998 \cdot 10^{8} \frac{m}{s} \cdot 3{,}336 \cdot 10^{-7} s = 100m$$

The calculated distance (S=100m) is equal to the sum of the measuring distance, i.e. (L+x=10m+90m). In other words, the laser generated photon must cover the distance of 100 meters before it hits the measuring target. The calculations seem to be correct.

– Photon's direction of movement is opposite to that of the vehicle's motion

$$x_2 = \frac{L}{\left(\frac{v}{c}+1\right)} = \frac{10m}{\left(\frac{0{,}9c}{c}+1\right)} = 5{,}263m \qquad (8)$$

$$x_1 = L - \frac{L}{\left(\frac{v}{c}+1\right)} = 10m - \frac{10m}{\left(\frac{0{,}9c}{c}+1\right)} = 4{,}737m \qquad (9)$$

$$t_{opp} = \frac{L}{c+v} = \frac{10m}{c+0{,}9c} = 1{,}756 \cdot 10^{-8} s \qquad (10)$$

Checking the distance covered by the photon in time t_{opp}

$$c = \frac{S_{opp}}{t_{opp}} \rightarrow S_{opp} = c \cdot t_{opp} \qquad S_{opp} = 2{,}998 \cdot 10^8 \frac{m}{s} \cdot 1{,}756 \cdot 10^{-8} s = 5{,}263m$$

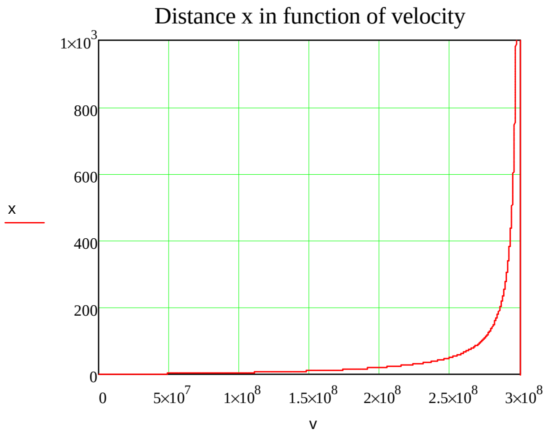
The result achieved (5,263m) is strictly correlated with distance (x_2). The calculations seem to be correct.

1.4.2 Numerical analysis of equations as a function of vehicle velocity.

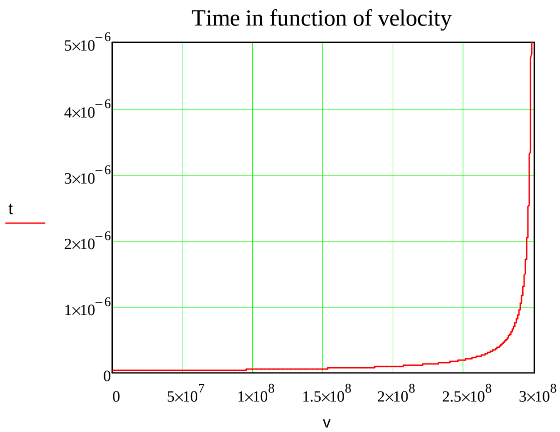
(3), (4), (8), (9), (10)

– Photon's direction movement is the same as that of the vehicle's motion

$$x = \frac{vL}{c-v} \quad (3) \qquad t = \frac{L}{c-v} \quad (4)$$



Graph 1. Distance (x) as a function of vehicle velocity.

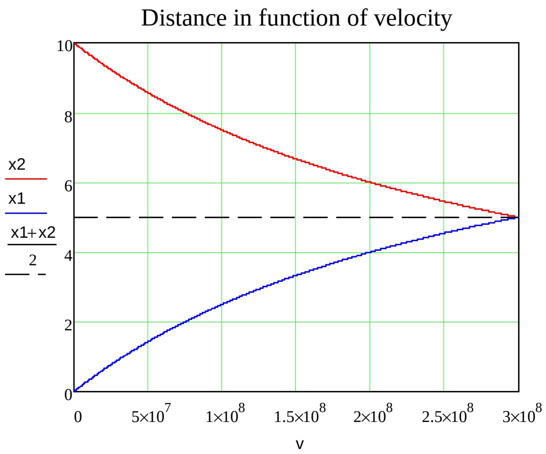


Graph 2. Time as a function of vehicle velocity.

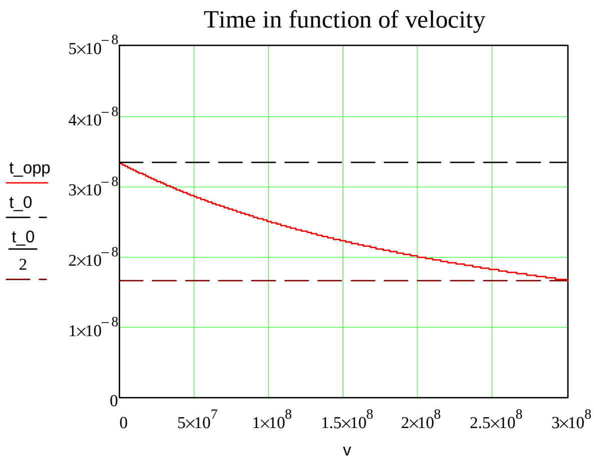
As vehicle velocity increases, so does the distance (x) that the photon flying in the same direction as the vehicle must travel. For high vehicle velocity values, (x) becomes considerably greater than (L). The photon must cover the *"excessive space"* to catch the measuring target. (Graph 1) and (Graph 2) are clearly correlated. The photon flying time is equivalent to the distance covered and vice versa. Both parameters (distance and time) depend on vehicle velocity.

– Photon's direction of movement is opposite to that of the vehicle's motion

$$x_2 = \frac{L}{\left(\frac{v}{c}+1\right)} \quad (8) \qquad x_1 = L - \frac{L}{\left(\frac{v}{c}+1\right)} \quad (9) \qquad t_{opp} = \frac{x_2}{c} \quad (7) \qquad t_{opp} = \frac{L}{c+v} \quad (10)$$



Graph 3. Distances (x_2) and (x_1) as a function of vehicle velocity.



Graph 4. Time as a function of vehicle velocity.

(Graph 3) shows the distance of photon flight (x_2) (red line) and distance (x_1), which will be travelled, at the same time, by the measuring target (blue line). For low vehicle velocity distance (x_2) is close to length (L). For vehicle's critical velocity (v=C) the distance (x_2) will undergo maximum shortening and it will be (x_2 =L/2). For better orientation (L/2) has been superimposed on the graph as a black dotted line. It should be pointed out that the sum of the distance covered by the photon and the distance covered by the target is always equal to length (L). This is compatible with the equation (5).

$$L = x_1 + x_2 \qquad (5)$$

(Graph 4) shows the dependence of time on the vehicle velocity equation. It is clearly correlated with plot (x_2) (red lines). The time (t_{opp}), after which the photon arrives at the target is proportionate to (x_2) distance that the photon must cover (intermediate formula 7). The distance (x_2) is dependent on vehicle velocity v (formula 8). The equation (10) is equivalent to equation (7) but the latter explains the plot better. Dotted black lines have been superimposed on the graph for better orientation. The top line represents time (t_{opp}) calculated for the stationary vehicle (v=0m/s). The bottom line represents time (t_{opp}) calculated for the vehicle velocity as it approaches the limit (v=C). This time value is exactly one half of the first time value.

It is worth noting that plots (x_2) and (t_{opp}) (red lines) have a decreasing nature, contrary to plots (x) and (t) presented in (Graph 1) and (Graph 2) respectively.

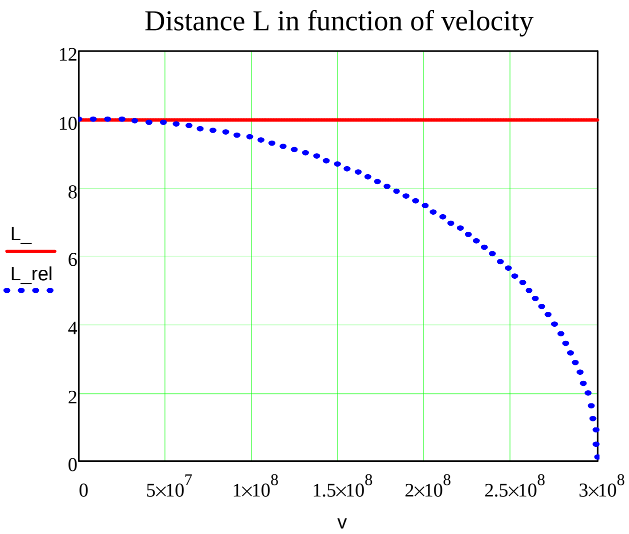
Vividly speaking, the faster the vehicle travels the sooner the photon arrives at its measuring target After all, the target "rushes" to meet the photon. Therefore, in the limiting case, when vehicle velocity is C (v=C), the photon will cover exactly half of the distance (L=10m). At the same time, the measuring target and the entire vehicle will cover in the space the distance equal to just 5 metres. So, the photon and the target will meet exactly in the middle of the space setting them initially apart. This statement seems to be compatible with logic and common sense.

1.5 Comparison of Experiment – C and the Theory of Relativity.

The results of the Experiment – C are incompatible with the Theory of Relativity. This fact should have already been noted by the reader. I wrote before about certain anomaly, which had appeared suddenly, unwelcome. It will now show its character more clearly. Although the anomaly will be observed, full explanation of its essence however, will only be presented in two subsequent experiments.

1.5.1 Relativistic version of Experiment – C.

So far the measurement distance (L=10m) was always the same. It was not subjected to the relativistic shortening. We can check what will happen if vehicle's relativistic shortening effect is taken into account. So, comparison of the results of the experiment with the Theory of Relativity will become easier.



$$L_{rel} = L \cdot \sqrt{1 - \frac{v^2}{c^2}} \quad (12) \quad \text{relativistic distance}$$

Graph 5. Comparison of distance (L) and its relativistic equivalent (L_{rel}).

The shortening of distance (L), together with the entire vehicle, occurs in its direction of movement. The shortening for both measuring systems (forward and opposite directions) should have the same value. It can't be any other way. Equations (3), (4), (8), (9) and (10) can be easily modified to their relativistic form. The modified equation versions have been presented in the table below. The equations' relativistic and standard versions have been presented in relevant plots. The results provided by the Theory of Relativity have also been placed on the same plots for comparison. In order to be able to compare both theories the relativistic time and gamma factor (see the Theory of Relativity) were calculated.

Modification of equations (3), (4), (8), (9) and (10) to their relativistic form:

Equation	Relativistic equation	photon & vehicle
$x = \frac{vL}{c-v}$ (3)	$x_{rel} = \frac{vL_{rel}}{c-v}$ (13)	identical direction
$t = \frac{L}{c-v}$ (4)	$t\gamma = \frac{L_{rel}}{c-v}$ (14)	identical direction
$x_2 = \frac{L}{\left(\frac{v}{c}+1\right)}$ (8)	$x_{2rel} = \frac{L_{rel}}{\left(\frac{v}{c}+1\right)}$ (15)	opposite direction
$x_1 = L - x_2$ (9)	$x_{1rel} = L_{rel} - x_{2rel}$ (16)	opposite direction
$t_{opp} = \frac{L}{c+v}$ (10)	$t\gamma_{opp} = \frac{L_{rel}}{c+v}$ (17)	opposite direction

Tab. 1. Summary of equations. The relativistic form of the equations takes into account the relativistic shortening effect.

$\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$ gamma factor – occurs in the Theory of Relativity

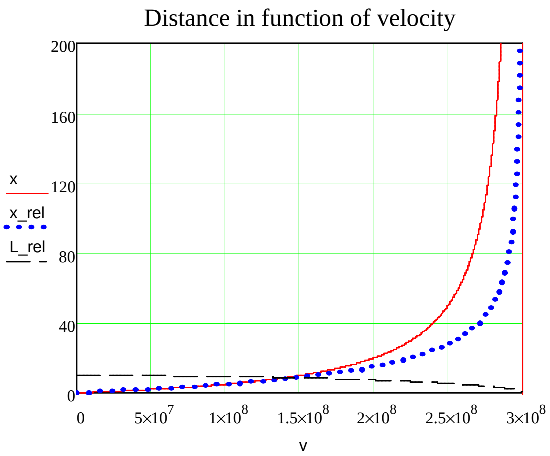
$t_0 = \frac{L}{c}$ (18) normal time is the time after which the photon shall cover the measurement distance (L)

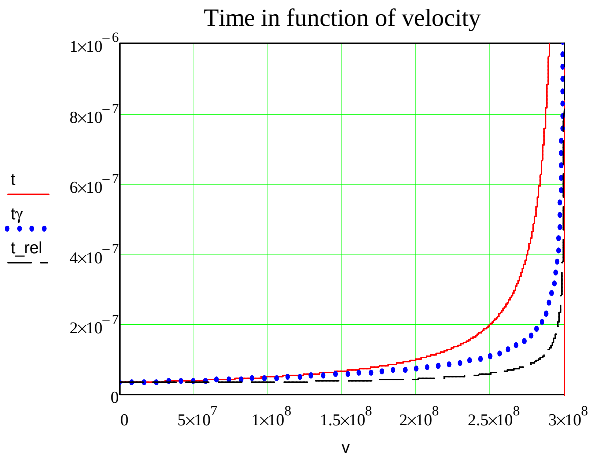
$t_{rel} = t_0 \cdot \gamma$ (19) relativistic time for the moving vehicle

The relativistic time originates from the dogmas of the Theory of Relativity. This is a product of the "normal" time, in other words "rest time", and the gamma factor. Graphs showing numerical equations solution, equations in their relativistic version and the relativistic time determined in accordance with the Theory of Relativity have been presented below.

1.5.2 Comparison of theories for photon's direction of motion being the same as that of the vehicle.

$x = \frac{vL}{c - v}$ (3) $x_{rel} = \frac{vL_{rel}}{c - v}$ (13) $t = \frac{L}{c - v}$ (4) $t\gamma = \frac{L_{rel}}{c - v}$ (14) $t_{rel} = t_0 \cdot \gamma$ (19)





Graph 6. Distance as a function of vehicle velocity.

Graph 7. Time as a function of vehicle velocity.

Graph 6. presents a comparison of numerical solutions of (3) and (13) equations. The plot of equation (3) (red line) is specific for Experiment – C. The plot of equation (13) (blue dotted line) takes into account the relativistic shortening of the vehicle's deck and, at the same time, shortening of the measurement distance as postulated by the Theory of Relativity. It should be remembered that the measurement distance is (x+L) for Experiment – C and (x_{rel}+L_{rel}) for its relativistic version. Both plots differ. A question has been raised, which one is correct? Graph 6. does not answer this question. The presented problem becomes more comprehensible after analysis of the time graph 7.

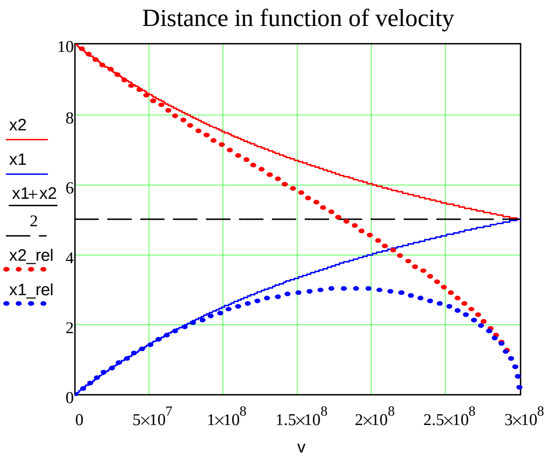
Graph 7. presents a comparison of numerical solutions of the equations (4), (14) and (19). The red line represents equation (4) and shows the time plot for Experiment – C. The blue dotted line represents equation (14) and shows the time plot for Experiment – C's relativistic version. The distance (L) is subject to relativistic shortening therein. It is quite surprising that none of the plots coincide with the third plot. It is presented by a black dotted line. This line represents the equation (19), which illustrates a theoretical calculation of the relativistic time proposed by the Theory of Relativity. The results of the Experiment – C are incompatible with the results of the Theory of Relativity. Taking into account the impact of relativistic shortening on the vehicle does not change this fact. The Theory of Relativity is disparate with Experiment – C.

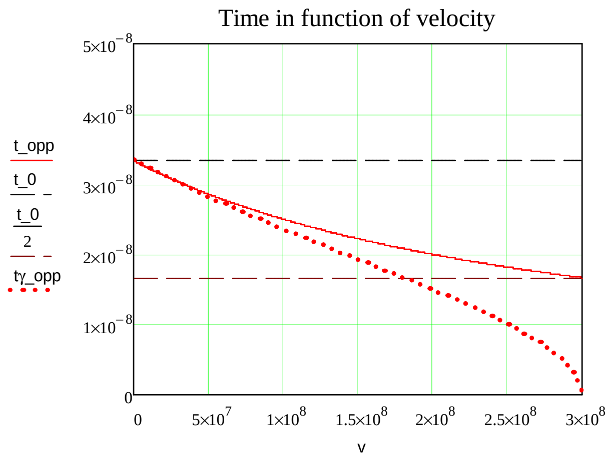
So, where is the cause of this situation, where is the fault? I have thoroughly analysed the Experiment – C and its fuller version, i.e. Experiment – cosine C. I haven't found any logical errors. I have analysed also the experiment with the light clock described in the Theory of Relativity. I have found some subtle errors in it. I have described it more accurately in the second part of this book, which comprises Experiment – L. I must ask the reader to be patient and to read subsequent sections in the order in which they appear. Every graph, every formula, animation and drawing bring us closer to the truth, which is subtle and impossible to explain in a single sentence. Only the entire content reveals all the subtleties and explains the hidden logical error.

1.5.3 Comparison of theories for photon's direction of motion being opposite to that of the vehicle.

$$x_2 = \frac{L}{\left(\frac{v}{c}+1\right)} \quad (8) \qquad x_{2rel} = \frac{L_{rel}}{\left(\frac{v}{c}+1\right)} \quad (15) \qquad t_{opp} = \frac{L}{c+v} \quad (10) \qquad t\gamma_{opp} = \frac{L_{rel}}{c+v} \quad (17)$$

$$x_1 = L - x_2 \quad (9) \qquad x_{1rel} = L_{rel} - x_{2rel} \quad (16)$$





Graph 8. Distances (x_2) and (x_1) as a function of vehicle velocity. ***Graph 9. Time as a function of vehicle velocity.***

Graph 8. presents distances (x_{1rel}) and (x_{2rel}) set out for the relativistic version of Experiment – C. The distances (x_1) and (x_2) have been plotted in for better orientation. The distance (x_{1rel}) behaves in a very strange and "unnatural" way (see the blue dotted line). Firstly, it increases with vehicle velocity increase and then it starts decreasing down to zero. The distance (x_{2rel}) decreases with vehicle velocity increase down to zero. The measuring system composed of the laser and measuring target blends into one. I shudder to think what happens to the brave astronauts. The relativistic shortening effect operates really effectively. The quickly moving vehicle has lost one of its dimensions and essentially it has ceased to exists. Let's put our vehicle aside and let's look into the skies. Galaxies that have been drifting away from us at high velocity (v≈C) should also be subject to the relativistic shortening. According to the Theory of Relativity the escaping galaxies should be as thin as a sheet of paper. The anomaly becomes unbearably big. This threatens the existence of all galaxies. It would be better to get back to our vehicle; where has the fault been hiding? Does the relativistic shortening proposed by the Theory of Relativity have any physical sense? It seems to me that is doesn't.

Graph 9. is valid conditionally. If the relativistic shortening effect is valid, than the plot is valid. If the effect does not exist, the plot is invalid.

1.5.4 Gamma vs. Omega.

A new factor can be determined. I called it the omega factor and compared it with the gamma factor. (Ω) is a ratio of photon flight time for the moving vehicle and photon flight time for the stationary vehicle (t/ t_0).

t – photon flight time over moving vehicle's deck,

t_0 – photon flight time over stationary vehicle's deck.

The omega factor occurs in several versions:

Distance (L) is invariable as a function of vehicle velocity. Both the photon and the vehicle move in the same direction.

$$\Omega = \frac{t}{t_0} \qquad (20) \qquad\qquad t_0 = \frac{L}{c} \qquad (18)$$

Distance (L) is subject to the relativistic shortening as a function of vehicle velocity. Both the photon and the vehicle move in the same direction.

$$\Omega_{rel} = \frac{t\gamma}{t_0} \qquad (21)$$

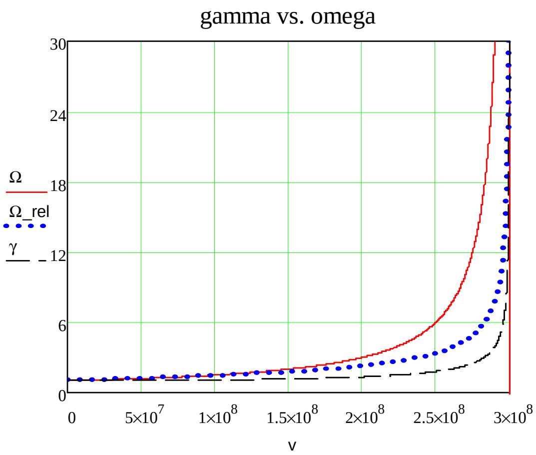
Distance (L) is invariable as a function of vehicle velocity. The photon and the vehicle move in opposite directions.

$$\Omega_{opp} = \frac{t_{opp}}{t_0} \qquad (22)$$

Distance (L) is subject to the relativistic shortening as a function of vehicle velocity. The photon and the vehicle move in opposite directions.

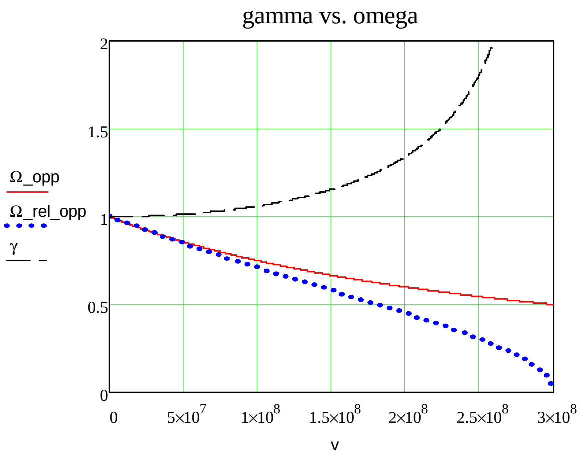
$$\Omega_{rel\_opp} = \frac{t_{opp} \cdot \gamma}{t_0} \qquad (23)$$

the same direction of photon and vehicle



Graph 10. Comparison of γ and Ω factors.

opposite directions of photon and vehicle



Graph 11. Comparison of γ and Ω_{opp} factors.

1.6 Partial conclusions.

- Passengers of vehicles on-board of which optical experiments are performed are subject to a specific illusion. They think that the measurement distance is always invariable and precisely defined (L). This is not true. The voyagers can (and even must) observe only that section of the space that is limited by vehicle's dimensions (windows of the vehicle are obscured). This space does not correspond to that area of space in which the real optical phenomena occur.
- The voyagers observe, in the vehicle's flight direction, a somewhat bigger space (blue bar) in a smaller space limited by vehicle's dimensions (green bar). It seems that the space shrinks but it is only an illusion.
- The voyagers observe, in the direction opposite to vehicle's flight direction, a shorter space (yellow bar) in a longer space limited by vehicle's dimensions (green bar). It seems that the space expands but as before it is only an illusion.
- The real distance between the photon and relevant measuring target depends on vehicle velocity and on the direction in which the optical experiment is performed.
- It is possible to determine vehicle's absolute velocity. Equation (11) gives a chance for its calculation.
- The assumption of the Theory of Relativity, saying that vehicle's absolute velocity cannot be determined, appears to be false! If this conclusion appears to be true, it may change many things in physics.
- The results obtained during performance of Experiment – C are incompatible with the results provided by the Theory of Relativity. The gamma and omega factors give divergent results.

Experiment – cosine C

(illusive space-time)

2. Experiment – cosine C.

The Experiment – cosine C arose first. Due to slightly higher degree of complexity compared with the previously presented experiment, it's been placed here in second place. It also makes a more general case than Experiment – C. In my opinion it is the Experiment – cosine C that best explains the spatial and optical phenomena occurring for great vehicle velocities. The experiment name may seem strange to the reader. This can be explained very simply. Light rays "run" at angle alpha in relation to the vehicle's direction of motion. The trigonometric function cosine (α) was used to determine several important physical parameters. C is a symbol of the speed of light in vacuum. Concatenation of those names simply makes **Experiment – cosine C**. The structure of subsections and their arrangement is similar to that of the previous chapter, although it is not identical. Comparison of the results of this experiment with the Theory of Relativity has been omitted. The results are almost identical as in section (1.5). I have checked this by comparing results of relevant calculation scripts. I decided to not reproduce superfluous information. Instead I have introduced more computer animations. They appear to be very useful in gaining a complete understanding of the presented problems.

The experiment conditions are similar for all subsections. As in the previous experiment vehicle velocity is always constant (v=0.9C). Only in numerical analysis as a function of vehicle velocity, the velocity is changed with a fixed step. The vehicle features zero acceleration at the moment of measurement (analysis). The assumed measurement distance is (L=10m). This is the distance from the optical lens located before the laser to the measuring target.

It appears that the angle of incidence of light on the measuring target depends on vehicle velocity. This phenomenon has been presented in a spectacular way in several computer animations commencing from the simplest case down to the most complex. The animations facilitate imagination of a situation, which seemingly appears to be impossible and contrary to the intuition. The conclusions that follow, after viewing the animations, have been described formally in form of relevant mathematical equations.

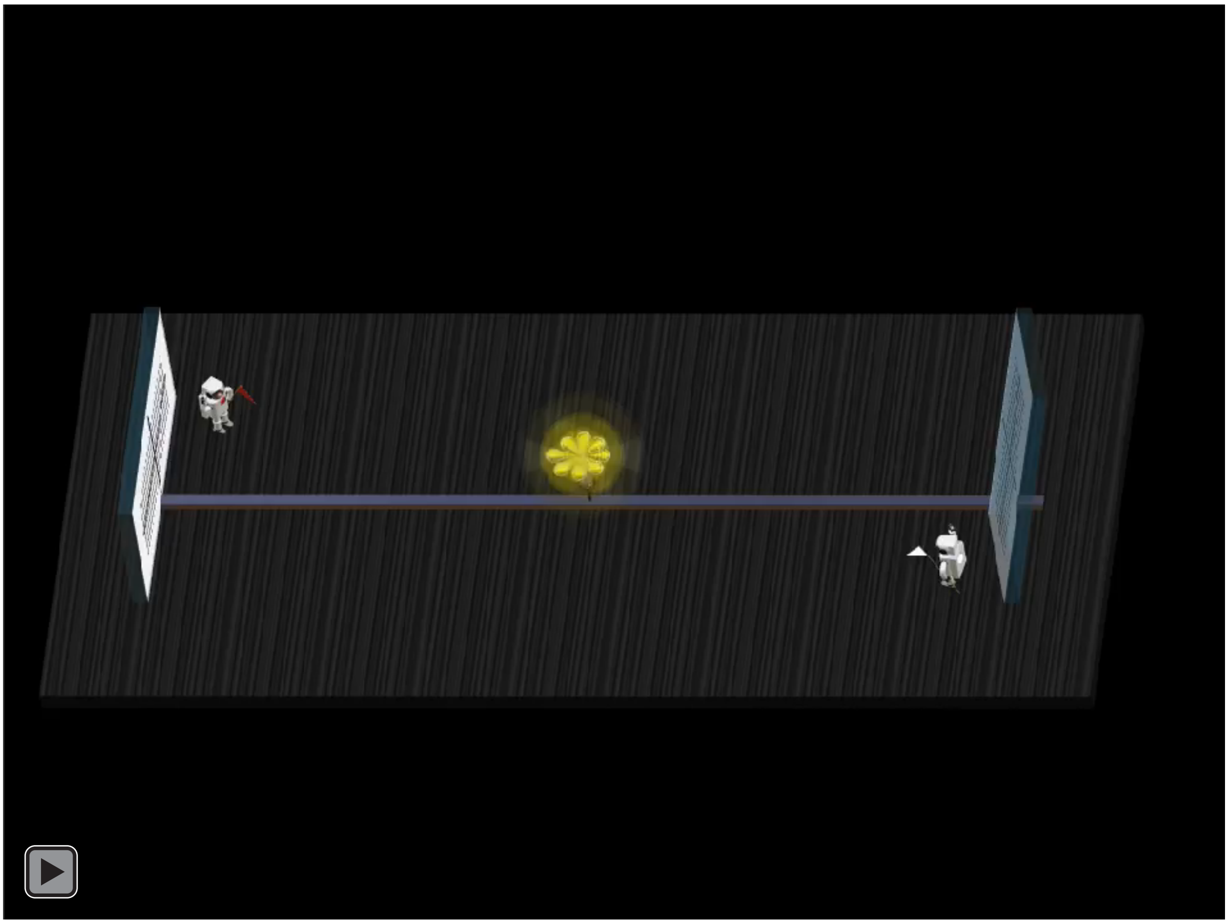
The basis for the experiment is a physical law named *„free space loss"*. Almost everyone knows it even if he/she is not aware of this.

„For a point source of light, such as a switched on light bulb, the optical power of radiated light decreases with increase of the distance from the source, and is proportional to $\left(\frac{1}{r^2}\right)$*".*

There are many various forms and varieties of this law. The simplest one known to me is *„The farther we are the less we see"*. This is the free space loss phenomenon that is responsible for origination of a relationship between the angle of light falling on the measuring target and vehicle velocity.

The free space loss phenomenon has been presented in the animation and photograph below.

Animation – you should click on the animation area.



Anim.4. The free space loss phenomenon. Photons increasingly diverge.

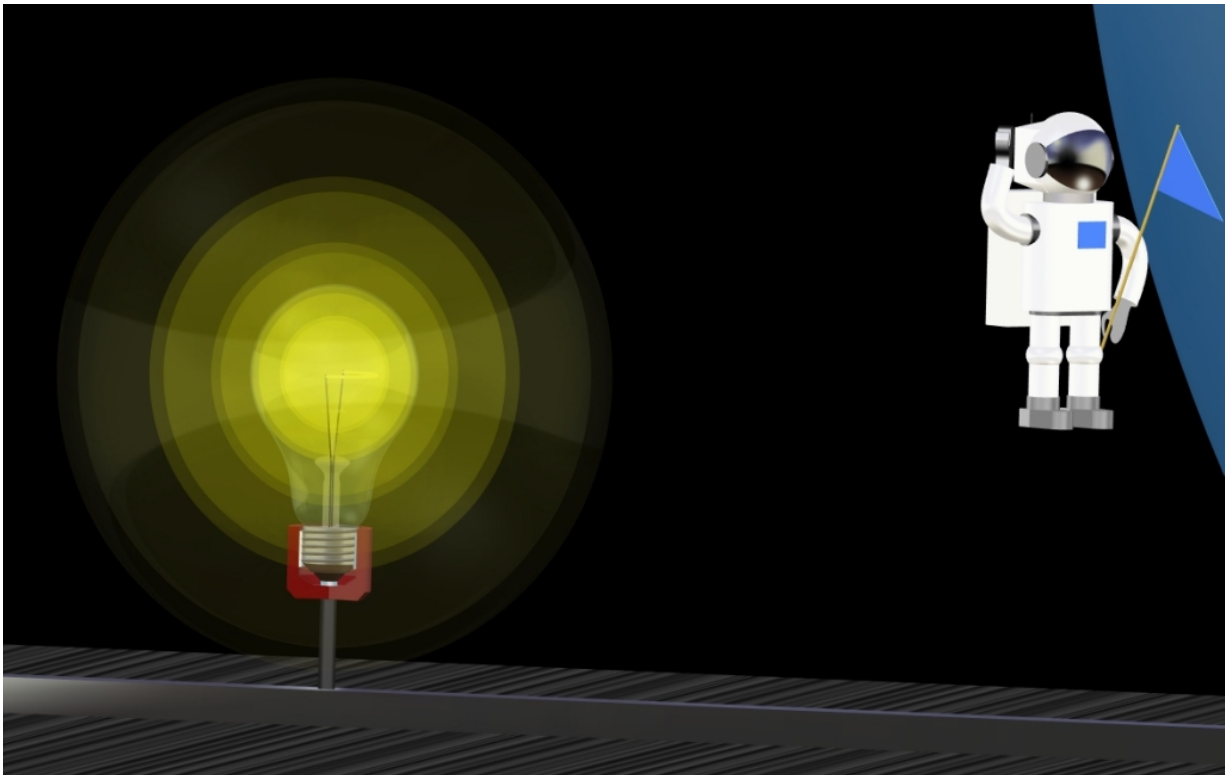
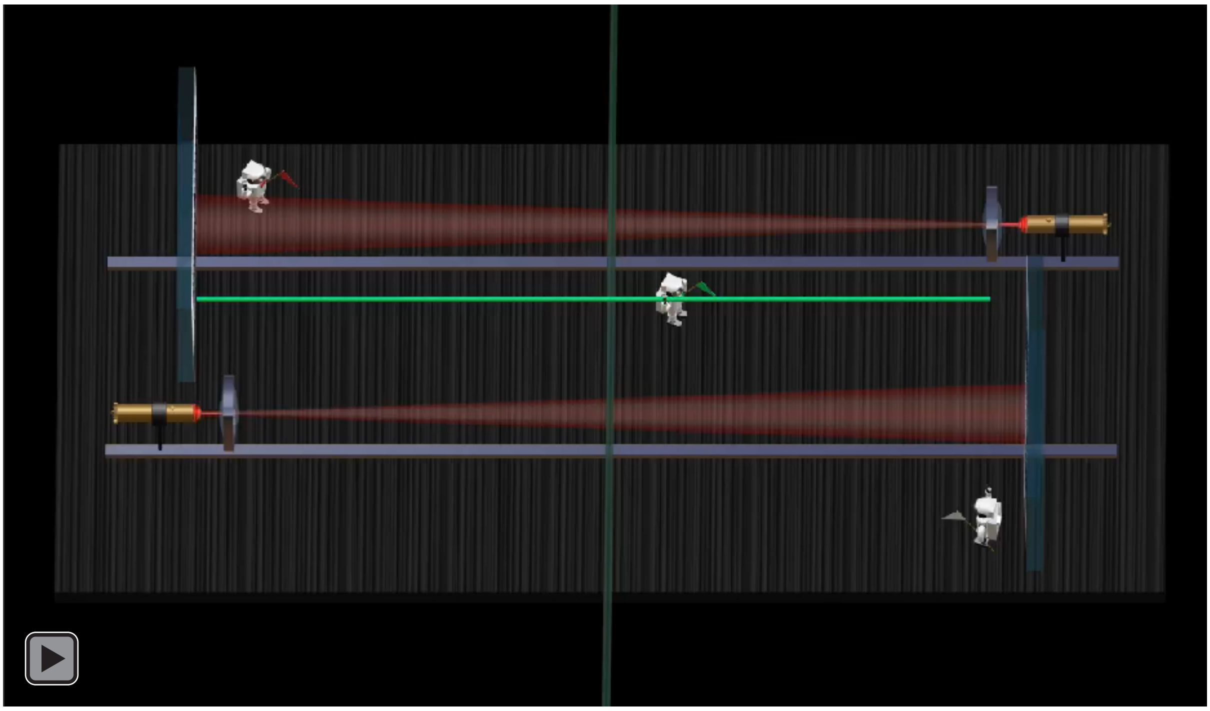


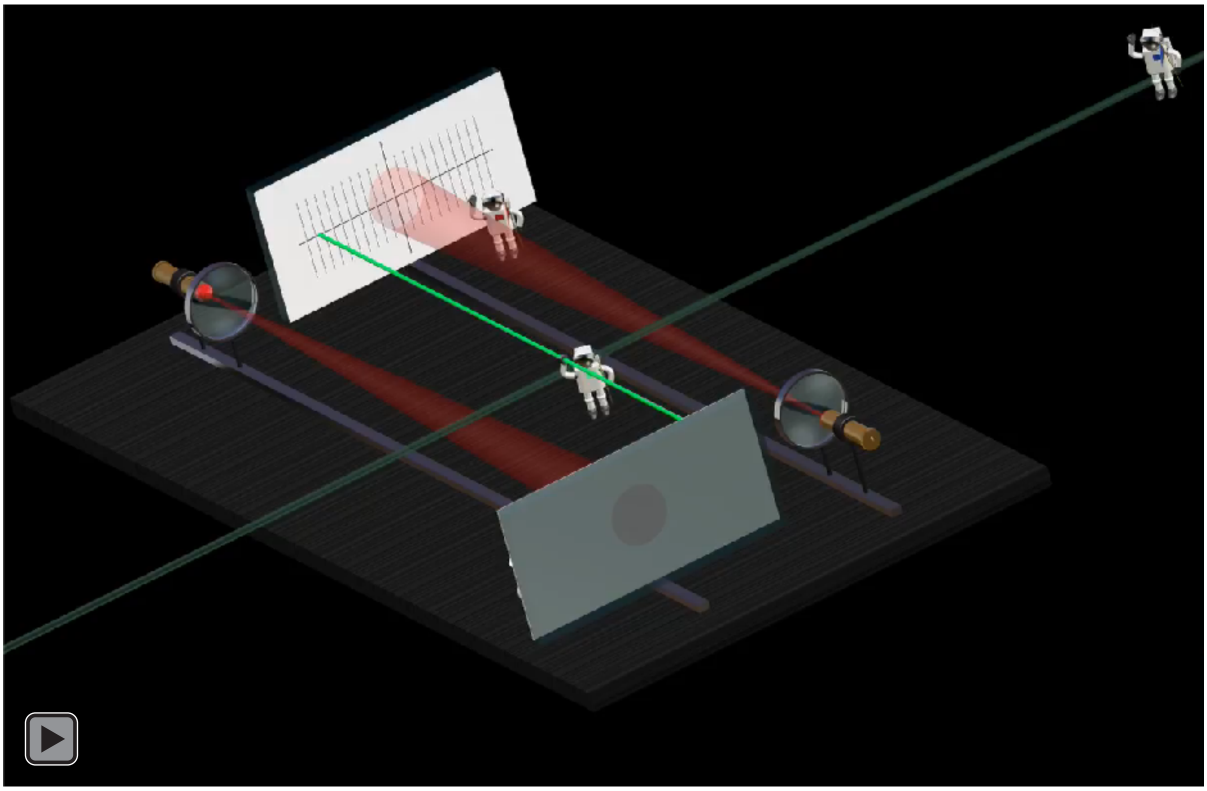
Photo 2. The free space loss phenomenon. Darkening circles of light are visible.

2.1 Visual analysis of photons in a cone of light. Stationary vehicle.

Animation – you should click on the animation area.



Anim.5A. Laser beam split in optical lenses. General view.

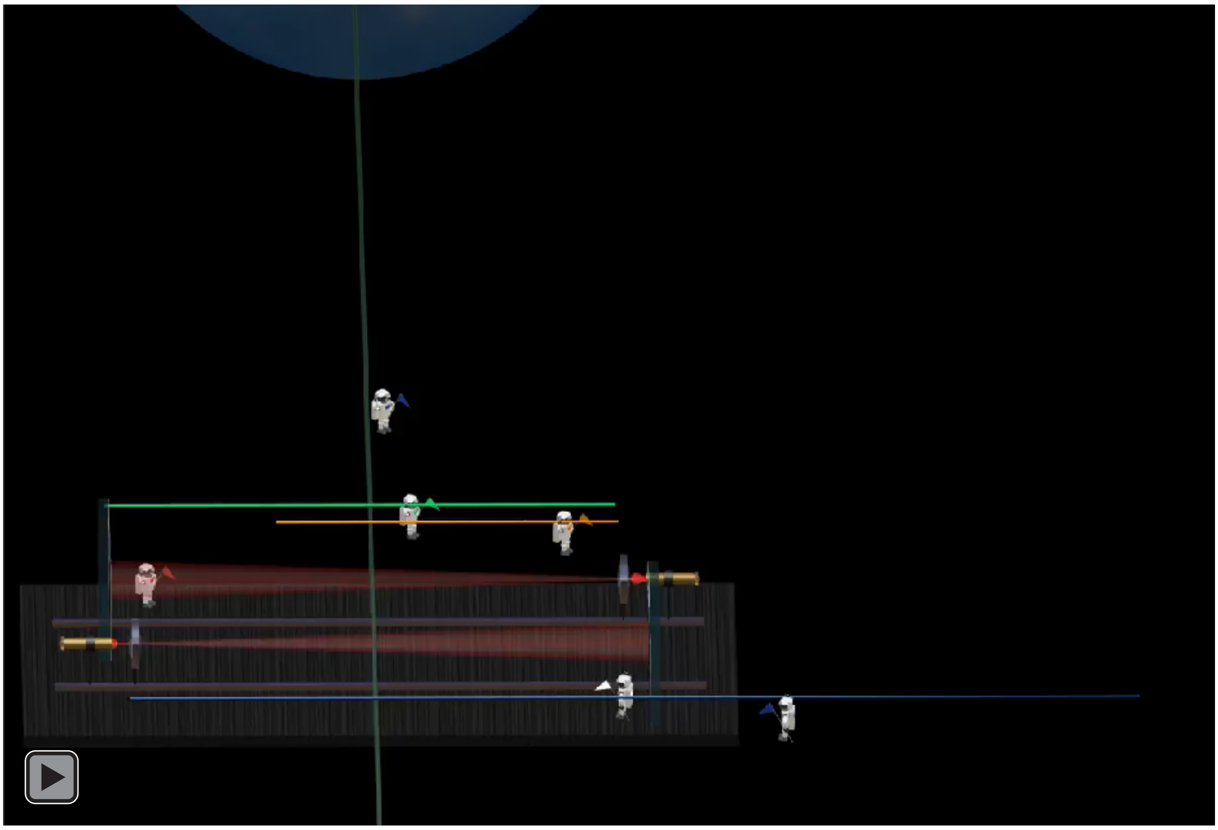


Anim.5B. Laser beam split in optical lenses. View towards the measuring target. Both light spots have identical dimensions.

The Experiment – cosine C was modified with relation to the previously presented one. The modification consists of the introduction of diverging lenses into the optical path. The laser generated stream of photons creates a cone of light. The extreme photons “fly” at an angle alpha with relation to the optical axis. The angle assumed for the purpose of the animation is (α=2deg). Previously the optical axis was co-located with the laser beam. Currently the optical axis is invisible. It is a virtual line running through the middle of the cone of light. It links the centre of the optical lens with the centre of the measuring target. The measurement distance is (L=10m). This is the distance measured from the lens to the respective measuring target. This distance has been determined by a green bar held by the green astronaut. Animations 5A and 5B in reality constitute one animation. Only the camera’s angle of observation has changed and nothing more. In animation 5B the parallax error caused by the change of the angle of observation is seen. It seems that the photons cross the green auxiliary laser beam at different times, but it is only an optical illusion.

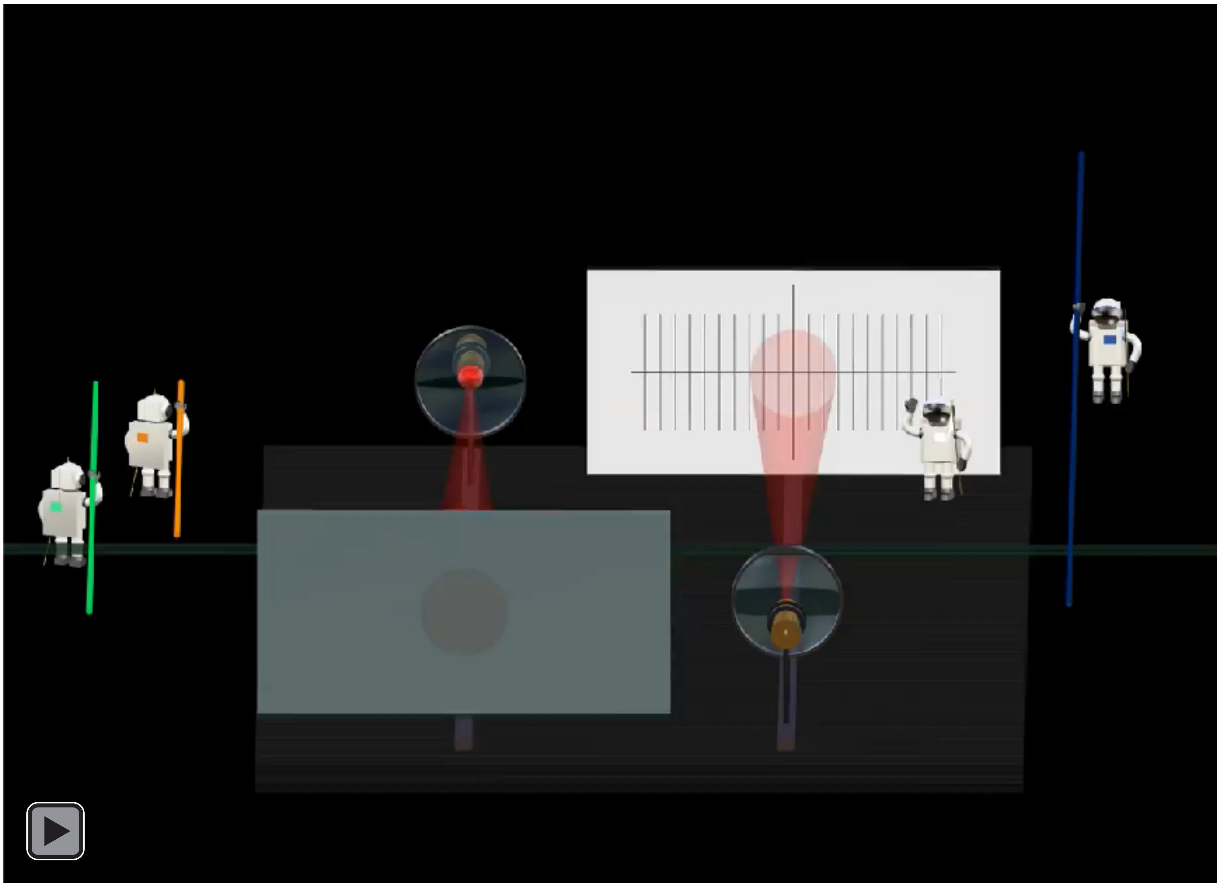
Because the vehicle is stationary, the light spots created on both measuring targets have the same values of radius (R). The cones of light should be invisible in the outer space. We should remember that the astronauts are located in a tightly closed spacecraft that has been isolated from the environment having its own atmosphere. In order to be able to observe the internal phenomena all vehicle’s elements, except its floor, were omitted.

2.2 Visual analysis of photons in a cone of light. Moving vehicle.



Anim.6A. Vehicle in motion (v=0.9C). General view. This animation contains a hidden error.

The situation presented in animation 6A seems to be compatible with the expectations. The measuring bars measure precisely the distance travelled by the photons. Cones of light have identical dimensions because both optical lenses are identical. The extreme photons fly at the angle of (α=2deg) with relation to the optical axis. They expand with relation to each other more and more. However, not all phenomena are clearly seen. This is caused by the previously mentioned parallax error. The camera has been placed simply at an angle, which prevents observation of certain important details. You can see a little but not everything. The subsequent animation has only and exclusively changed the camera's observation angle.



Anim.6B. Vehicle in motion (v=0.9C). View of the measuring target in the direction of movement of the vehicle. The deliberate error in the animation is visible.

Divergence of the extreme photons with relation to the cone of light is now clearly visible. An error has appeared in the animation. Why the extreme photons diverge more than the cone of light? Do they have different angles fixed in the programme? The answer is “no”. The cone of the angle of light and the extreme photons angle of flight are identical and they are (α=2deg). The computer programme that I have used to make the animations is well renowned and belongs to the best 3D modellers in the world. So, where is the error, if it’s not a fault in the programme?

Two phenomena are responsible for divergence of photons from the light spot created on the measuring target by the cone of light. The first phenomenon has a physical nature and it is simply an effect of free space loss. I have described it briefly before. The second phenomenon is of psychological nature. We expect that the cone of light will have identical shape for the moving and stationary vehicles. That’s what we expect, but it won’t be so because it can’t be so. The shapes of both cones of light (the movement in the same and opposite direction) in a moving vehicle differ.

The measurement distance measured by the astronauts/voyagers is (L=10m). Both models of cones of light were performed exactly for that parameter value. The situation was similar in section (2.1) for the stationary vehicle. Therefore, the cones of light were erroneously designed.

The fault in the animation is based on the fact that the cone of light having the same direction as the vehicle's direction of motion does not take into account the extra distance travelled by the photons. The blue measuring bar represents the total distance travelled by the photons, but as you can see it is clearly longer then measuring distance L (green bar) observed by the astronauts/voyagers. To the voyagers it always seems that the measuring distance is constant and it is (L). However, it should be remembered that they have been isolated from their surroundings. The blue bar is visible only to the external observers. We see the bar but the voyagers don't. This is the blue bar that should constitute the measurement distance.

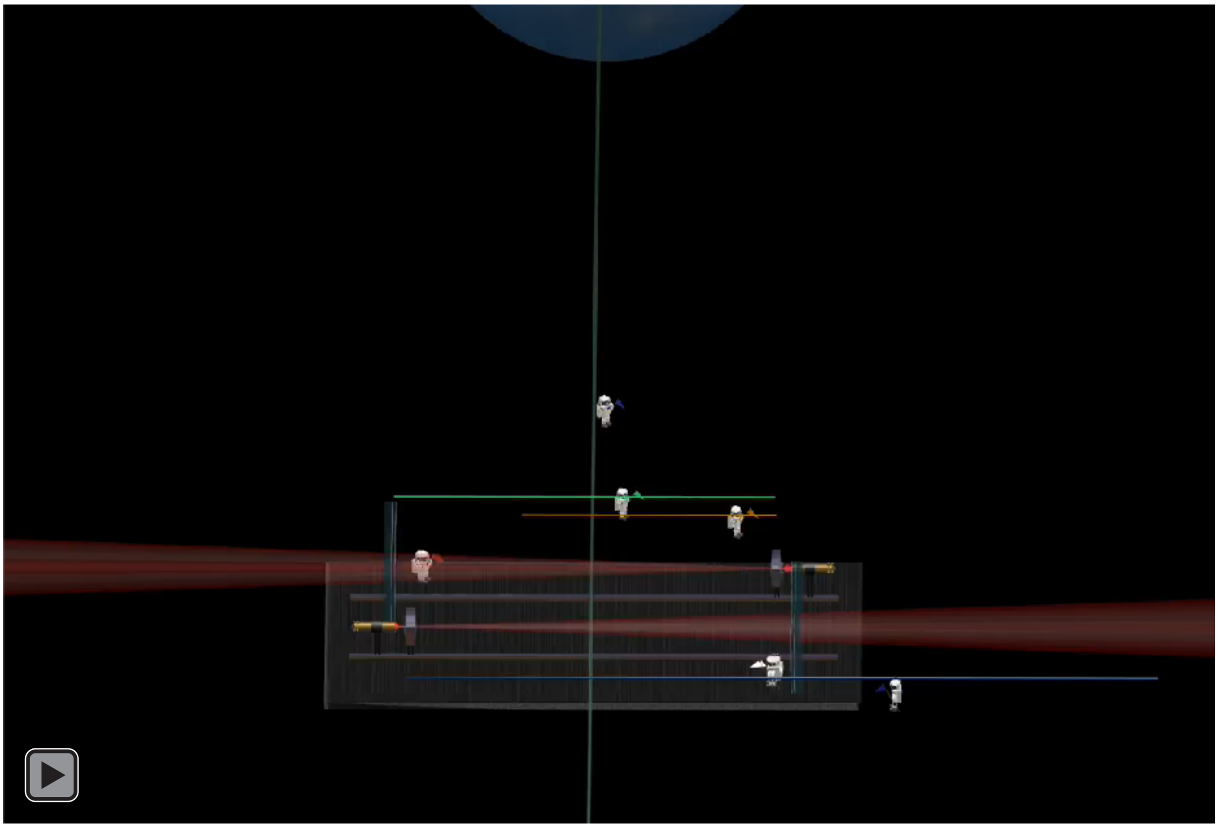
The cone of light having the direction opposite to the vehicle's direction of motion has also been presented erroneously, because it fails to take into account the fact that in this case the distance travelled by the photons is shorter then distance L (green). The yellow bar represents the distance travelled by the photons flying in the direction opposite to that of the vehicle. In this case the yellow bar's length should determine the measurement distance.

The cones of light constitute an observable spatial/optical phenomenon. Their shape depends on two factors. This is the alpha angle of the extreme photons and the real measurement distance determining the cone's length. Those quantities directly influence the value of the radius of the light spot reflected from the measuring target. In the presented animation values of the measuring distances of the cones of light were incorrectly selected. Incorrectly selected distance (and angle) causes the occurrence of the divergence between the cones of light and extreme photons. This divergence can be seen perfectly on the measuring target background.

The real measurement distance is very closely related with the alpha angle of the cones of light observed on-board the vehicle by the astronauts/voyagers. Therefore, the change of the measurement distance also changes the alpha angle for the observed cones. Relevant physical equations will be derived only in the next chapter. The entire problem should become clear then. At this stage it will suffice to say that I introduced the error in the animation deliberately. It is well known that it is best to learn from somebody else's mistakes. Therefore, before the correct solution will be presented, another animation containing an error will be shown. Such operation has a great impact on the imagination, and is very effective.

"The true sign of intelligence is not knowledge but imagination."

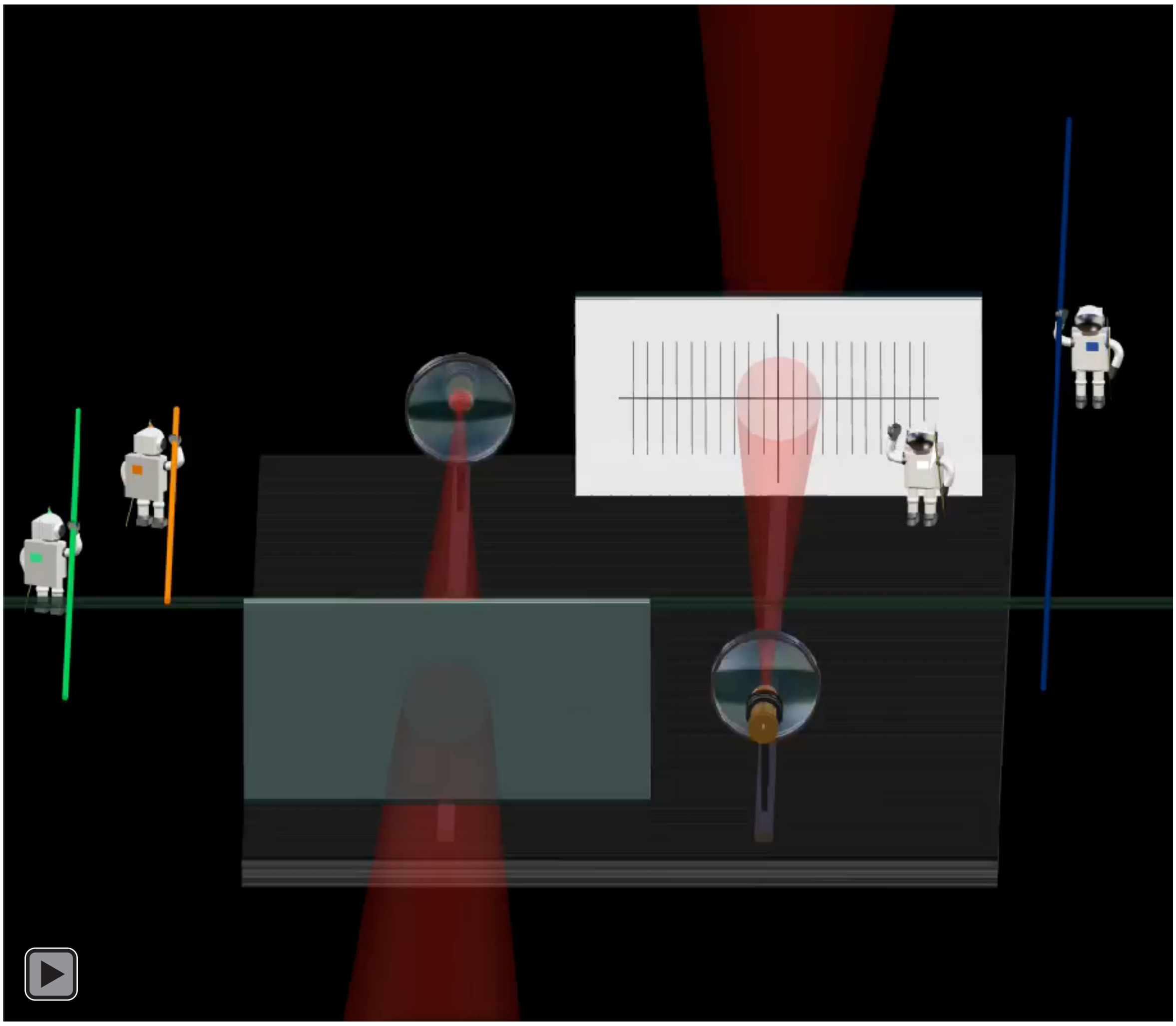
Albert Einstein



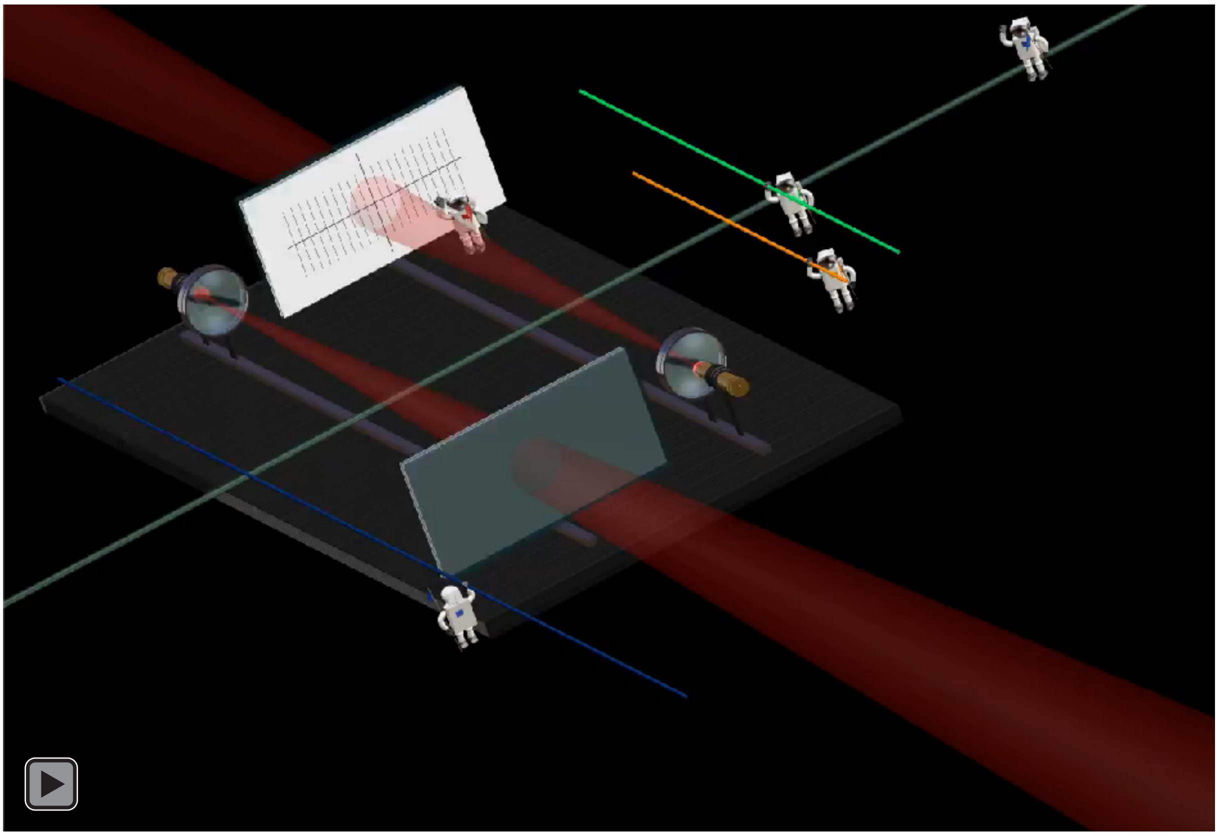
Anim.7A. Two vehicles superimposed. The stationary vehicle is the "ghost" of the real moving vehicle. Cones of light are stationary. This is a deliberate error. Cones of light should move together with the vehicle. General view.

Animation 7A shows two vehicles superimposed on each other. The stationary vehicle is a "ghost" of the moving one. The sources of light are lasers switched on only in the stationary vehicle. The moving vehicle has its lasers switched off and it does not emit any light. The measuring targets are semi-transparent to provide favourable observation and measuring conditions for the light spots. Such animation configuration provides the best conditions for observation of the spatial and optical phenomenon. It shows the free space loss phenomenon from its unknown side, as it were, in motion. Because the parallax error occurs here, several views of animation 7 have been shown at different angles of camera setting.

The deliberate animation error is based on application of the static sources of light. The cones of light do not move together with the moving vehicle, and for this reason the light spots observed on the vehicle's measuring targets change their radii. For a vehicle with constant velocity such occurrence is impossible. The light spots should have constant radii and the cones of light should move together with the moving vehicle.



Anim.7B. Two vehicles superimposed. View of the measuring target in the direction of movement of the vehicle. Cones of light are stationary.



Anim.7C. Two vehicles superimposed. View of the measuring target in the opposite direction to the direction of movement of the vehicle. Cones of light are stationary.

The divergence of the extreme photons and that of the cones of light is the same. Strangely, the extreme photons flying through the measuring targets are ideally superimposed on the light spot radius visible at the same time. This happens completely automatically. The free space loss phenomenon operates identically for the static cones of light and for the dynamic photons. This phenomenon is correct for both cases simultaneously.

The conclusions originating from observations of animation 7 (7A, 7B, 7C) are as follows:

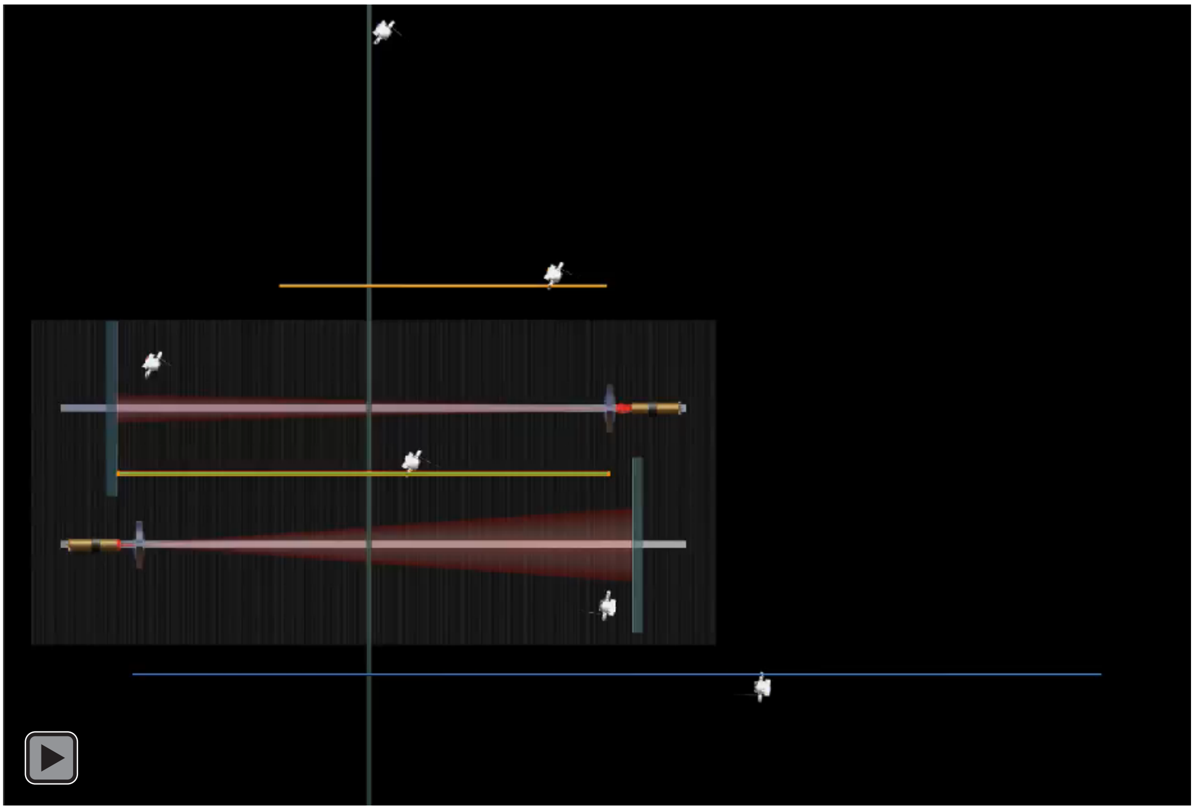
- Apparently it seams that animation 7 is faultless. The cones of light have a correct shape. Location of the extreme photons coincides precisely, at every moment, with the shape of the corresponding cone of light.

- A significant animation error can be seen on the measuring targets. This is a deliberate error. It is based on the fact that the observed radii of the light spots change their dimensions. For invariant vehicle velocity, the light spot radii should have a constant value. Variable light spot values on the targets constitute an impossible occurrence.

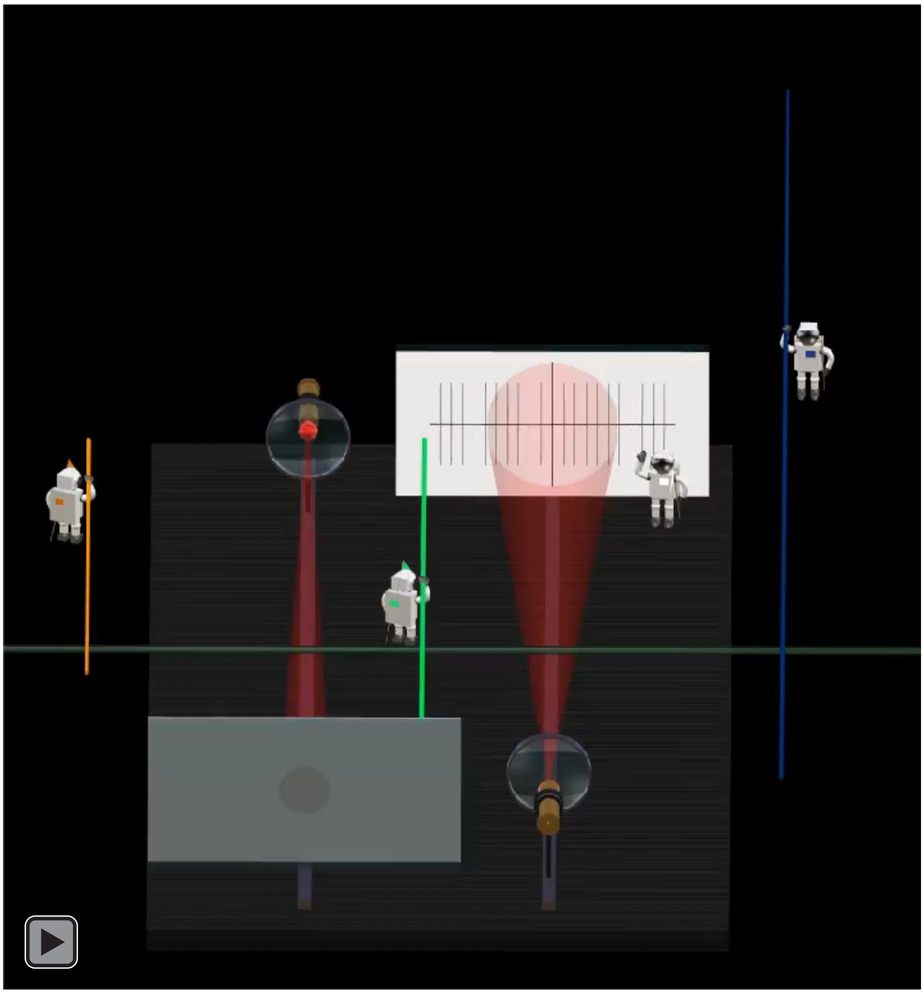
- In all animation versions, the cones of light should move together with the moving vehicle, just like a car travelling at night and illuminating the road ahead of it. The cone of light moves together with the car. When the car stops the cone of light stops too. The photons that constitute the cone are, of course, in motion but the cone of light itself stands still together with the car.

- Animation 7 needs to be corrected. The cones of light must move together with the vehicle. The shape of the cones observed by the astronauts/voyagers must change. Values of light spot radii seen on the measuring targets should remain constant in time. The radius of relevant light spot should have identical value as that for the distance of extreme photons measured from the middle of the measuring target.

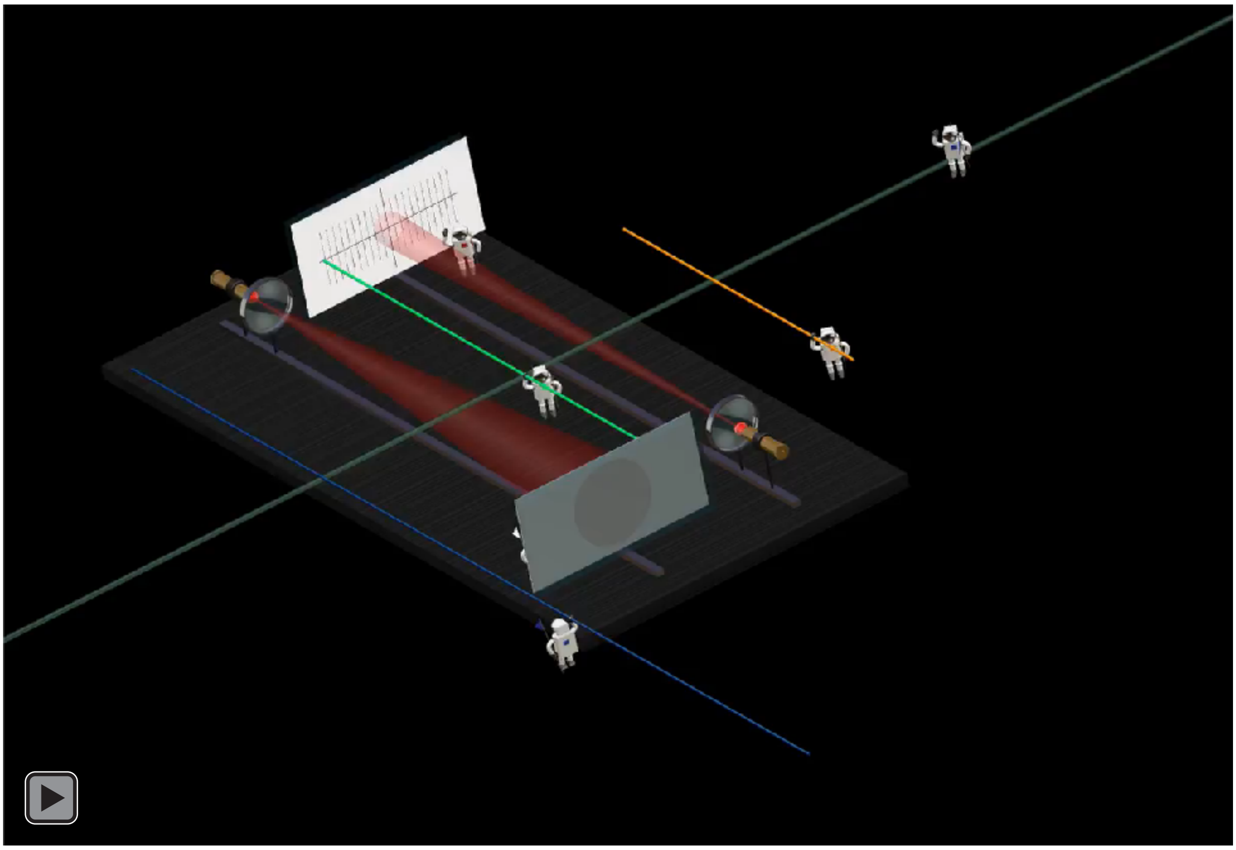
The postulates contained in the last conclusion have been included in animation 8. New models of the cones of light were designed and introduced into the animation. All versions of animation 8 differ from one another only by the camera observation angle.



Anim.8A. Shape of cones of light observed on-board the vehicle is different. Cones of light move together with the vehicle. General view.



Anim.8B. Shape of cones of light observed on-board the vehicle is different. Cones of light move together with the vehicle. View of the measuring target in the direction of movement of the vehicle.



Anim.8C. Shape of cones of light observed on-board the vehicle is different. Cones of light move together with the vehicle. View of the measuring target in the opposite direction to the direction of movement of the vehicle.

The cones of light observed aboard the moving vehicle have different shapes. The space observed by the voyagers always has constant length (L). This distance is determined by the green measuring bar held by the astronaut. The real measuring and observation distance is different. These are the two distances determined by the blue and yellow bars.

The optical beam direction is the same as the vehicle's direction of motion.

The proper observation distance in the vehicle's direction of motion has been fixed by the blue bar. The astronauts/voyagers observe somehow observe a bigger space (blue bar) in a smaller space limited by vehicle's dimensions (green bar). It seems that the space is shrinking, but this is only an illusion. The space is not shrinking. Vehicle's dimensions do not change even a tiny bit. The photons generated aboard the vehicle "chase the fleeing" measuring target. The dimensions of the observed cone of light undergo change. This is because the length of the observed cone of light (green bar) is shorter than its real value (blue bar). The observed cone of light will shrink. Change of its dimensions automatically forces change of the alpha angle value. The above described phenomenon is of a very subtle nature. The cone of light will shrink but the space won't. The space does not shrink even in slightest degree. This phenomenon has been somehow forced by the free space loss effect. In principle, this is the free space loss effect alone observed in motion. It is its dynamic (moving) version.

The static angle of the optical beam's cone (α=2deg) must be replaced by a dynamic angle. The new angle should have higher value.

The optical beam direction is opposite to the vehicle's direction of motion.

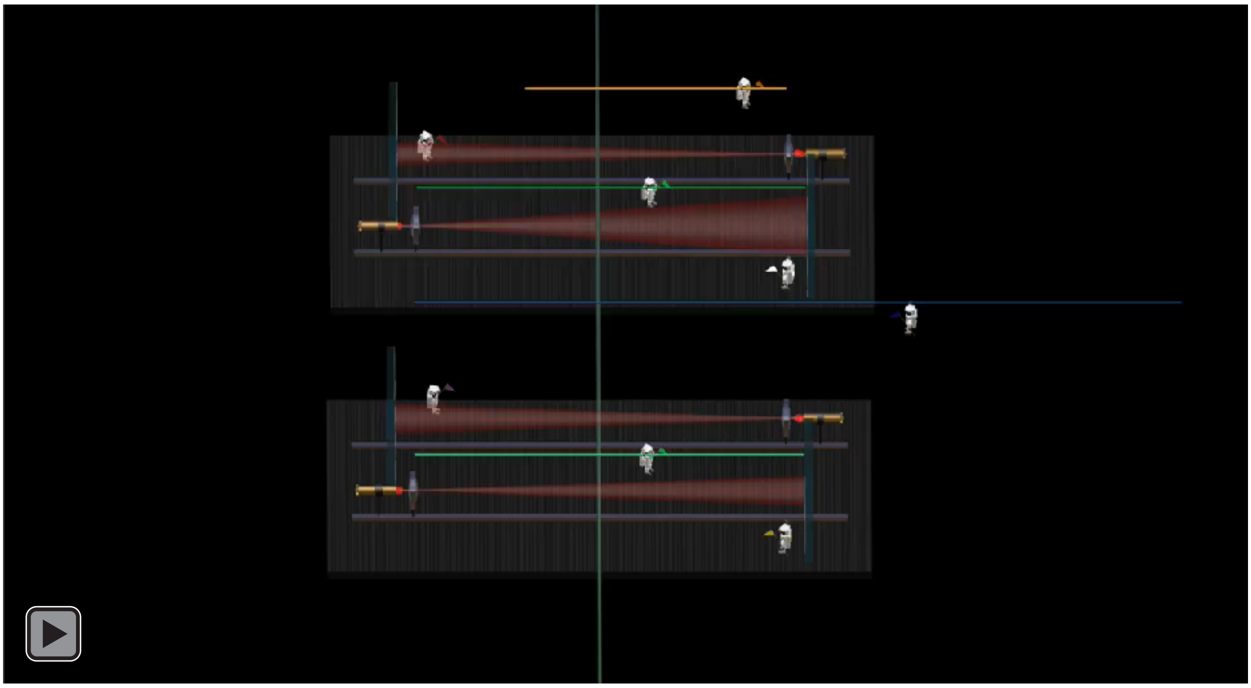
The proper observation distance in the direction opposite to the vehicle's motion has been fixed by the yellow bar. The astronauts/voyagers observe a shorter space (yellow bar) in a longer space limited by the vehicle's dimensions (green bar). It seems that the space is expanding but, as in the previous case, this is only an illusion. The space is not expanding. If it were so, the space should expand and shrink at the same time. This is infeasible. Spinning space loops would occur and the vehicle's motion would probably become impossible. In such conditions the vehicle could be destroyed. Essentially, the vehicle would definitely be destroyed. The space should remain "passive" and unchanging. Therefore, vehicle's dimensions are not subject to the relativistic shortening; only the dimensions of the cone of light observed on-board the vehicle, will change. This is because the observed cone of light's length (green bar) is longer than its real value (yellow bar). The photons move in the direction opposite to that of the vehicle. One can say that the measuring target "rushes to meet" the optical beam's photons. The observed cone of light will be "stretched". Change of its dimensions automatically forces a change of the value of the alpha angle.

The static angle of the optical beam's cone (α=2deg) must be replaced by a dynamic angle. The new angle should have lower value. Just like in the previous case this phenomenon is somehow forced by the free space loss effect. This is the effect of free space loss observed in motion, its dynamic (moving) version.

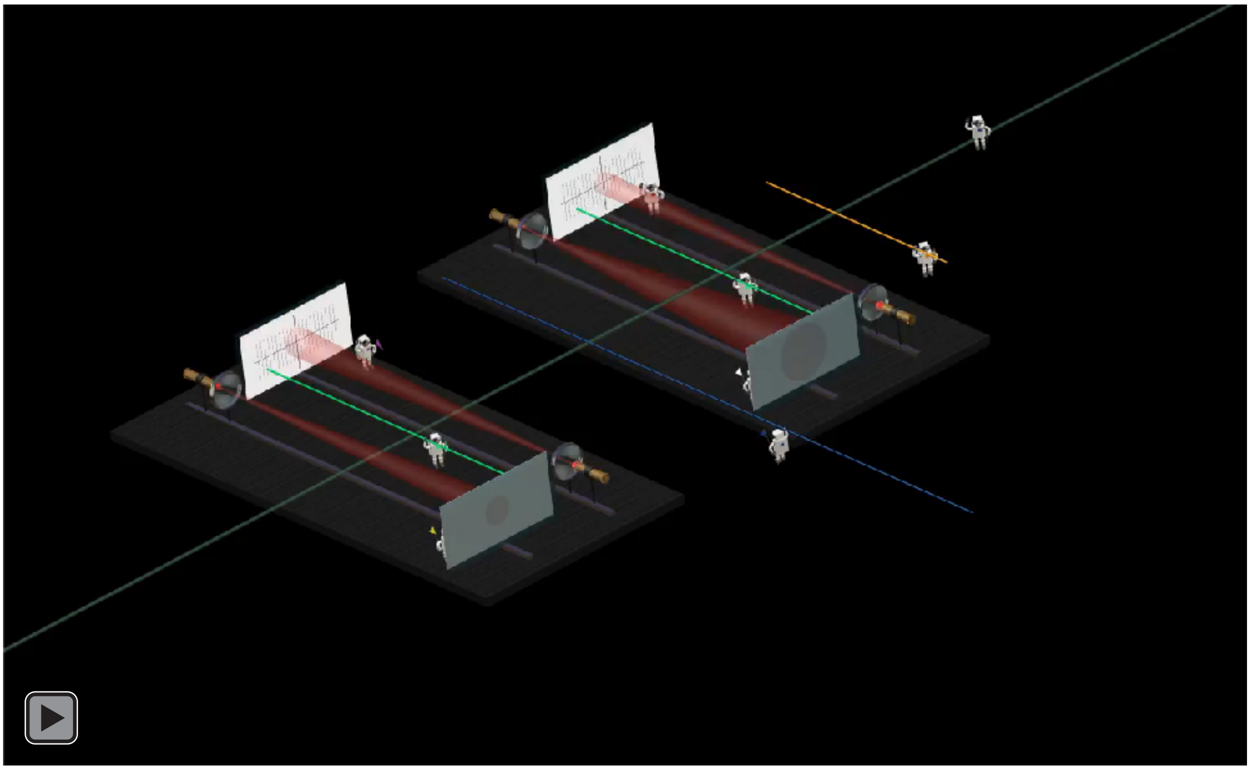
The above-presented phenomenon is highly elusive. In one moment it becomes comprehensible, only to slip away from the mind a moment later. The mathematical form of the problem has been presented in the next section (2.3). It will allow us to get rid of the unwanted elusiveness and will provide an opportunity of complete understanding of the described phenomenon. Values of the angles of both cones of light in animation 8 were precisely defined and included in the programme. However, I didn't give their numerical values. Animation 8 is complete and it can constitute the final form for Experiment – cosine C. There is a way to increase the expressive power of impact on your imagination. A comparison of the stationary and moving vehicles in a single approach provides a fantastic cognitive effect.

"One picture is a thousand of words. One animation is a thousand of pictures."

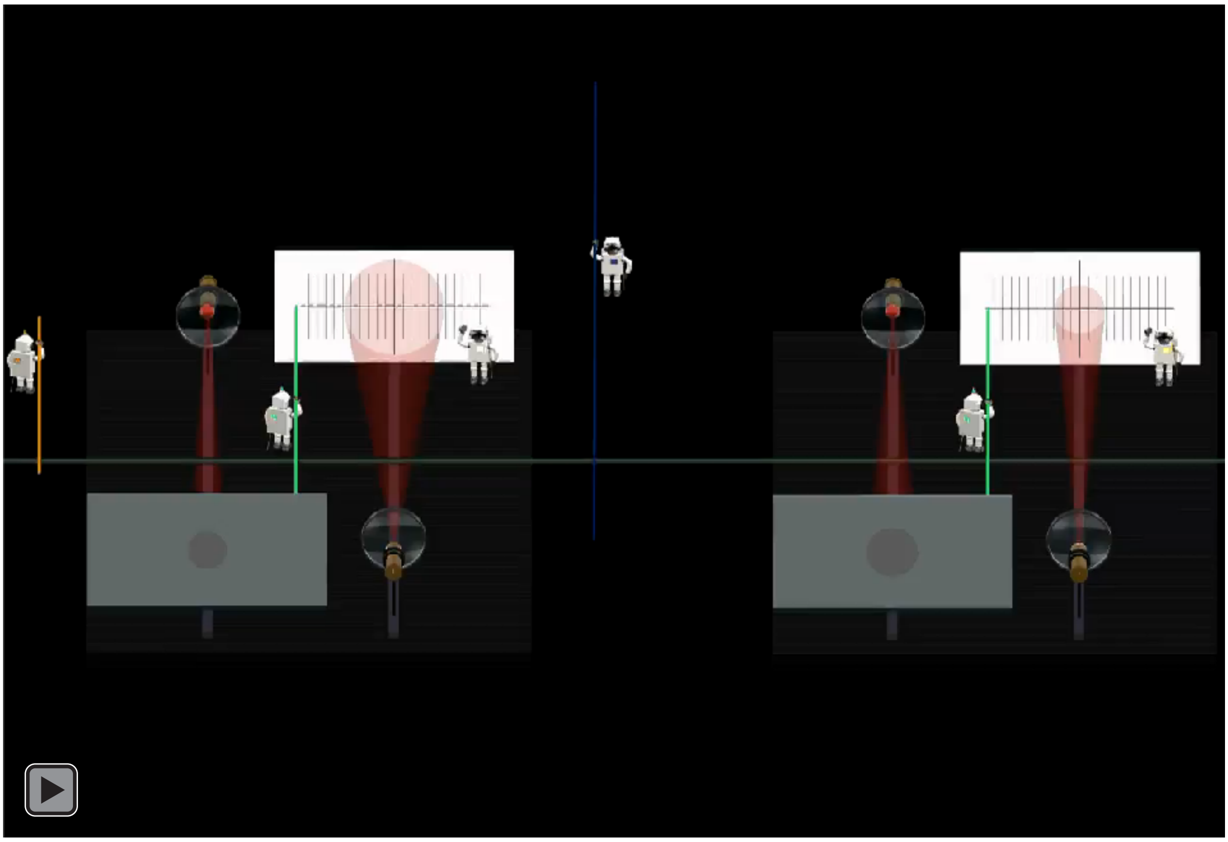
According to a proverb, to describe a situation well, one should show many animations.



Anim.9A. Comparison of the stationary and moving vehicles. General view.



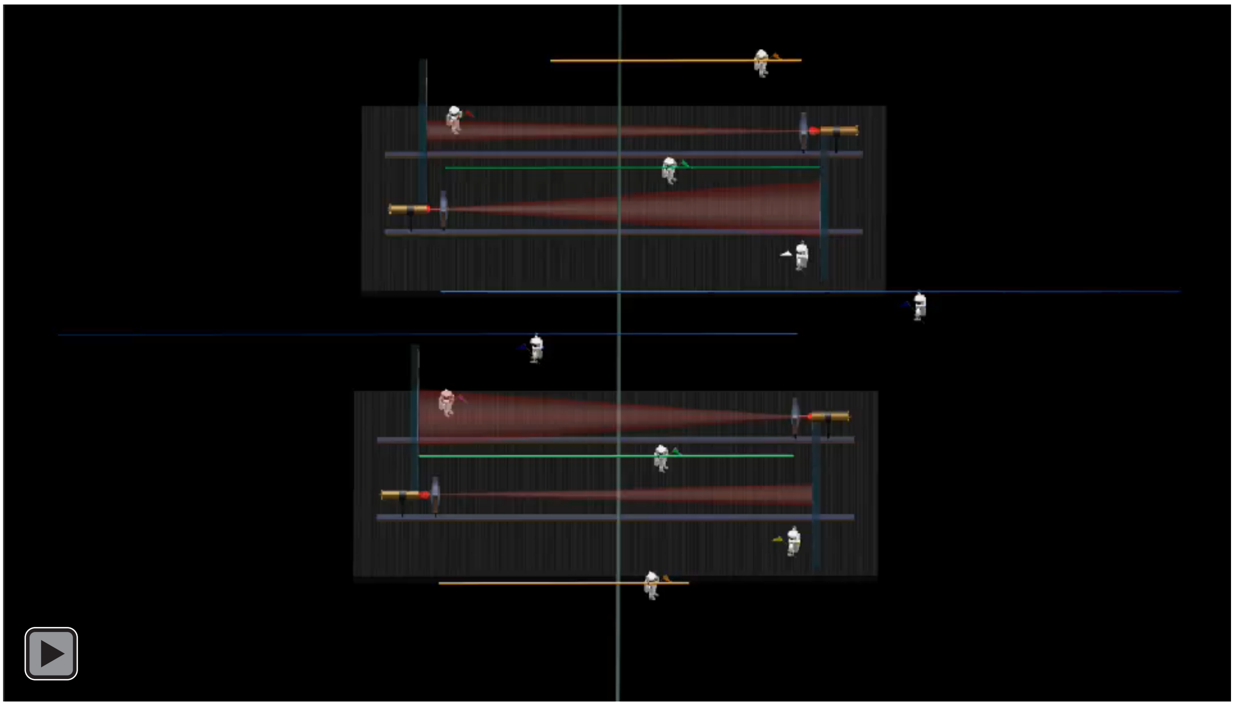
Anim.9B. Comparison of the stationary and moving vehicles. View of the measuring target in the direction of movement of the vehicle.



Anim.9C. Comparison of the stationary and moving vehicles. View of the measuring target in the opposite direction to the direction of movement of the vehicle.

Dimensions of light spots on all four measuring targets should be compared. The sequence of occurrences is very important. The stationary vehicle has cones of light featuring identical dimensions. The spots on measuring targets have identical radii. The photons' flight time is identical. Contact with the surface of both measuring targets occurs at the same moment. The situation on-board the moving vehicle is totally different. Spots of light have different dimensions and the occurrences take place at different moments in time. The total number of photons is 12. For every moment, the divergence of the stationary vehicle's photons is identical with the divergence of the moving vehicle's photons. The photons move independently of the vehicles. The free space loss phenomenon is responsible for the degree of their divergence. In both presented cases the result is identical. Divergence of those photons that cover the same distance is identical. This can be checked by replaying the animation shot-by-shot or several times. The cones of light observed on-board the moving vehicle have different dimensions. In both cases the cone inscribing line coincides with the flight path of the extreme photons.

The last animation provided for this experiment shows two moving vehicles. The direction of their flight is opposite. All the photons have been generated at the same moment.



Anim.10. Comparison of two moving vehicles. The vehicles move in opposite directions. General view.

Distribution of the measuring bars and their length values are important. Just like before, all the photons have the same velocity. The photons "diverge" at the same degree.

"In science a physical picture is often more important than the mathematics used to describe it."

Michio Kaku

2.3 Mathematical analysis.

The main objective of the mathematical analysis is determination of correct physical parameters of the cones of light observed on-board the moving vehicle. This will allow for derivation of the vehicle's absolute velocity equation.

In order to be able to define those parameters, we should first derive the modified versions of the equations (3), (4), (8), (9) and (10). Those equations were derived in the previously presented Experiment – C. Only the equivalents of the equations (3) and (8) are really necessary. The other equations were derived additionally. Becoming acquainted with them would be helpful in understanding the problem.

The mathematical analysis has been divided into several subsections:

- Modification of the Experiment – C equations (3), (4), (8), (9) and (10)
- Equations of light spot radii (R) and (R_{opp})
- Equations for the angles of the cones of light observed on-board the vehicle
- Vehicle's absolute velocity. Radius-based method.

Each of the above subsections of the mathematical analysis comprises equations for two different positions of the laser on-board the moving vehicle. Two optical beams featuring different cone shapes occur there. Existence of two different directions of optical beam propagation has forced an additional division of each of the subsections into two parts and they are, respectively:

- Photons' flight direction is the same as the vehicle's direction of motion,
- Photons' flight direction is opposite to the vehicle's direction of motion.

2.3.1 Modification of equations for Experiment – C.

For the beam of photons with cone shape, the time of arrival of particular photons at the measuring target is different. This is due to different distance that the photons have to cover in space. Those photons that move along the cone axis will arrive at the measuring target first. Those photons that move at the angle (α), i.e. along the cone generating line, will arrive at the measuring target last. Equivalents of the equations (3), (4), (8), (9) and (10) for those photons should be derived. This problem can be easily solved. This has been schematically illustrated in (Fig.4).

If velocity marked (cc) is known, substituting of it in all equations in place of speed C will lead to an easy transformation. The (cc) velocity is a projection of speed C on the optical axis. We can imagine that a photon flying at the angle (α) *"casts it's shadow"* onto the measuring bench. All we need to do is to define the speed of such *"photon shadow"* and substitute it into the previously derived equations. In this way new versions of the equation appear automatically. The primary value of the alpha angle is known. C is, of course, the speed of light in vacuum.

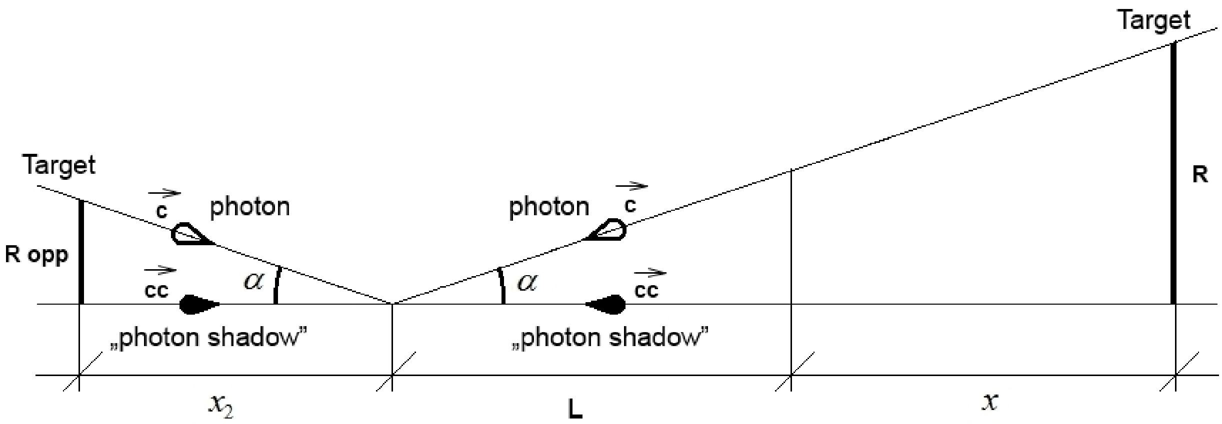


Fig. 4. Schematic cross-section of the cones of light. Both cones are shown side by side for comparison.

$\cos(\alpha) = \frac{cc}{c} \rightarrow cc = c \cdot \cos(\alpha)$ **(24) cc is a symbol of velocity of „photon shadow" (it is not C^2 !)**

$c = 2{,}998 \cdot 10^{8} \frac{m}{s}$

The modified versions of the equations (3), (4), (8), (9) and (10) determined for the photons flying at the angle (α) to the optical bench take the following form:

Experiment – C	**Experiment – cosine C**	**photon & vehicle**
$x = \frac{vL}{c - v}$ (3)	$x = \frac{vL}{cc - v}$ (25)	compatible direction
$t = \frac{L}{c - v}$ (4)	$t = \frac{L}{cc - v}$ (26)	compatible direction
$x_2 = \frac{L}{\left(\frac{v}{c} + 1\right)}$ (8)	$x_2 = \frac{L}{\left(\frac{v}{cc} + 1\right)}$ (27)	opposite direction
$x_1 = L - \frac{L}{\left(\frac{v}{c} + 1\right)}$ (9)	$x_1 = L - \frac{L}{\left(\frac{v}{cc} + 1\right)}$ (28)	opposite direction
$t_{opp} = \frac{L}{c + v}$ (10)	$t_{opp} = \frac{L}{cc + v}$ (29)	opposite direction

Tab. 2. Modified equations of distance and time for Experiment – cosine C.

Derivation of the equations (25) and (27) allows us to arrive at the main point of this section. This is getting the values of radii (R and R_{opp}) of the light spots created on the measuring targets. This, in turn, will allow us to define the vehicle's absolute velocity by application of the radius-based method.

2.3.2 Equations for light spot radii (R) and (Ropp).

– Direction of photons is the same as the vehicle's direction of motion

Mathematical determination of a light spot's radius value (R) is not a difficult task. (Fig.4) shows a sketch of two cones of light. The light spot radius R is visible on the figure's right side. The spot appeared on the measuring target. The angle (α) and distance (L) are known whereas the distance (x) has been defined by the equation (25).

$$tg(\alpha) = \frac{R}{x+L} \rightarrow R = tg(\alpha)\cdot(x+L) \qquad (30) \qquad \text{value (x) can be substituted by equation (25)}$$

$$R = tg(\alpha)\left(\frac{vL}{cc-v}+L\right) = tg(\alpha)\left(\frac{vL+L(cc-v)}{cc-v}\right) = tg(\alpha)\left(\frac{vL+L\cdot cc-vL}{cc-v}\right) = tg(\alpha)\frac{L\cdot cc}{cc\left(1-\frac{v}{cc}\right)}$$

The radius of the light spot on the measuring target, when the direction of photons is the same as the vehicle's direction of motion, takes the form of equation (31).

$$R = tg(\alpha)\frac{L}{\left(1-\frac{v}{cc}\right)} \qquad (31) \qquad \text{equation of (R)}$$

– Direction of photons is opposite to the vehicle's direction of motion

Light spot's radius (R_{opp}) is seen on the left side of (Fig.4). The angle (α) is known whereas the distance (x_2) has been determined by the equation (27).

$$tg(\alpha) = \frac{R_{opp}}{x_2} \rightarrow R_{opp} = tg(\alpha)\cdot x_2 \qquad (32) \qquad \text{value } (x_2) \text{ can be substituted by equation (27)}$$

The radius of the light spot on the measuring target, when the direction of photons is opposite to the vehicle's direction of motion, takes the form of equation (33).

$$R_{opp} = tg(\alpha)\frac{L}{\left(\frac{v}{cc}+1\right)} \qquad (33) \qquad \text{equation of } (R_{opp})$$

The light spot's radius equations (31) and (33) have been used to determine the vehicle's absolute velocity by application of the radius-based method.

2.3.3 Equations for the cone of light angles observed on-board the vehicle.

Values of the cone of light angles observed on-board the vehicle are not used for determination of the vehicle's absolute velocity. Yet it is worth knowing them as this allows, for example, setting up of proper 3D models (cones of light) for computer animations (presented in section 2.2).

– Direction of photons is the same as the vehicle's direction of motion

The length of the optical beam that is observable on-board the moving vehicle is (L). This is the distance between the optical lens located in front of the laser and the measuring target. The real cone of light has the angle (α) and length (L+x). This is the distance which the photons cover before they illuminate the measuring target. The target "runs away" from the photons, which "strive to reach" the target. Longer real distance (L+x) must be observed by the astronauts/voyagers in a shorter space (L). The observable space has been limited by the vehicle's dimensions. The shape of the observable optical beam must change. The "static" angle (α) of the cone of light must be replaced by a new "dynamic" angle (α_2). This process is automatic and it depends on the vehicle velocity. It is schematically presented in (Fig.5).

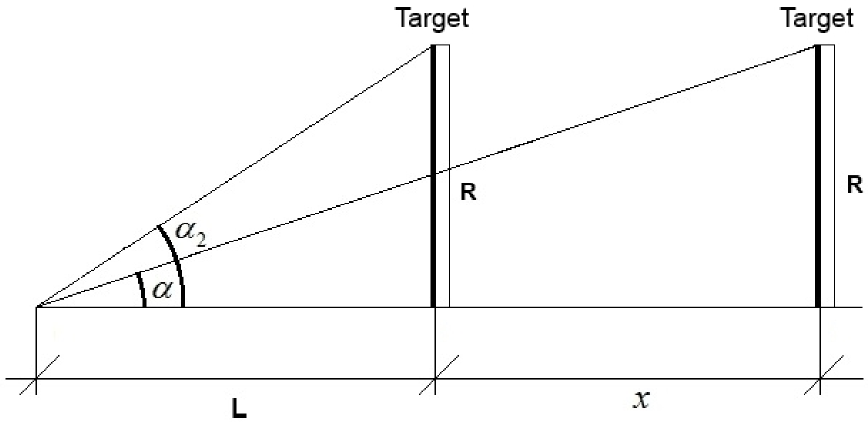


Fig. 5. Cone of light on-board the moving vehicle. Alpha angle of the cone changes. Cone's actual length is (L+x). The voyagers watch the entire cone at a shorter distance (L). Static angle (α) must be substituted by the dynamic angle (α_2). Angle of the observed cone of light widens.

Determining the value of the angle of the cone of light observed by the voyagers seems possible and easy to accomplish. The alpha angle changes automatically with vehicle velocity change. It is enough for the voyagers to use a protractor; just that. Contrary to the voyagers, any static observers cannot use the protractor as they are not on-board the vehicle. They must calculate mathematically the appropriate angle's value. The static astronauts know the vehicle velocity, which is unknown to the voyagers. This information greatly facilitates the opportunity for performance of relevant calculations. These have been presented below.

$$tg(\alpha_2) = \frac{R}{L} \qquad (34) \qquad \Leftarrow \qquad R = tg(\alpha)\frac{L}{\left(1-\frac{v}{cc}\right)} \qquad (31)$$

The equation (31) can be substituted into (34) and properly transform it.

$$tg(\alpha_2)=\frac{R}{L}=\frac{tg(\alpha)\dfrac{L}{\left(1-\dfrac{v}{cc}\right)}}{L}=\frac{tg(\alpha)}{\left(1-\dfrac{v}{cc}\right)}$$

$$tg(\alpha_2)=\frac{tg(\alpha)}{\left(1-\dfrac{v}{cc}\right)} \qquad (35) \qquad \text{equation of } tg(\alpha_2)$$

The angle of the cone of light, when the photons fly in the same direction as the vehicle is moving, can be determined from the equation (35). To determine the value of function tg(α_2) we need to assume a specific vehicle velocity value (v) - (iteration). The angle (α) is known. Using mathematical tables we can read the value of angle (α_2) for the calculated tangent function. An appropriate function in a mathematical programme or calculator may also be used. I did just that. A suitable calculation script automatically indicates values of all the angles of the cone of light. The presented here solution may not belong, perhaps, to the most elegant, but it is effective. It is important that the static observers have the ability to calculate the value of the cone of light's angle existing on-board the vehicle. The astronauts/voyagers simply measure this angle using a protractor.

– Direction of photons is opposite to the vehicle's direction of motion

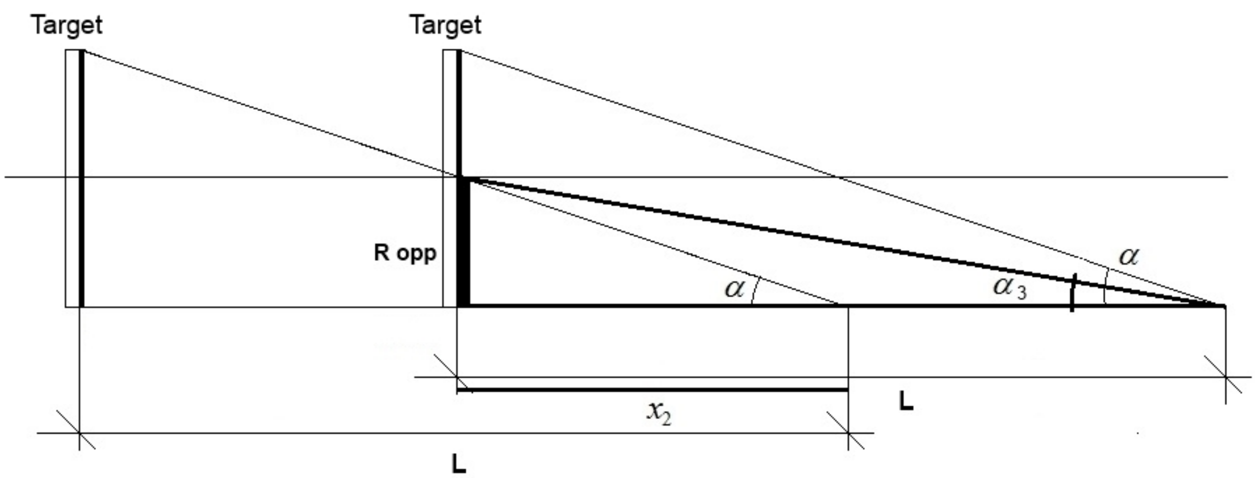


Fig. 6. Cone of light on-board moving vehicle. Alpha angle of the cone observed by the voyagers changes. Cone's real length is (x_2). The voyagers watch the entire cone at longer distance (L). Static angle (α) must be substituted by the dynamic angle (α_3). Angle of the observed cone of light decreases.

The length of the optical beam that is observable on-board the moving vehicle is (L). This is the distance between the optical lens located in front of the laser and the measuring target. The real cone of light has the angle (α) and length (x_2). This is the distance which the photons cover before they illuminate the measuring target. The target "rushes to meet" the photons. Shorter real distance (x_2) must be observed by the astronauts/voyagers in a longer space (L). The observable space has been limited by the vehicle's dimensions. Shape of the observable optical beam must change.

The “static” angle (α) of the cone of light must be replaced by a new “dynamic” angle (α_3). The length of the observable optical beam must also change. This process is automatic and it depends on the vehicle velocity.

Just like in the previous case, in order to determine the value of angle (α_3), the voyagers use a protractor. The static observers should perform appropriate calculations. They cannot use a protractor.

$$tg(\alpha_3)=\frac{R_{opp}}{L} \qquad (36) \qquad \Leftarrow \qquad R_{opp}=tg(\alpha)\frac{L}{\left(\frac{v}{cc}+1\right)} \qquad (33)$$

Equation (33) can be substituted into equation (36) and properly transform it.

$$tg(\alpha_3)=\frac{R_{opp}}{L}=\frac{tg(\alpha)\frac{L}{\left(\frac{v}{cc}+1\right)}}{L}=\frac{tg(\alpha)}{\left(\frac{v}{cc}+1\right)}$$

$$tg(\alpha_3)=\frac{tg(\alpha)}{\left(\frac{v}{cc}+1\right)} \qquad (37) \qquad \text{equation of } tg(\alpha_3)$$

The angle of the cone of light, when the photons fly in the direction opposite as the vehicle’s motion, can be determined from the equation (37). To determine the value of angle (α_3) one should proceed just like in the case of angle (α_2). A mathematical programme or a calculator should be used.

2.3.4 Absolute vehicle velocity. Radius-based method.

To determine the vehicle's absolute velocity, it will suffice to the measure values of radii (R) and (R_{opp}) of the light spots created on the measuring targets. The fact that the proposed method is independent of time is very important. The measurement conditions in a vehicle rushing with a constant speed (zero acceleration) do not change in time. The astronauts may perform relevant measurements at any moment. They simply do not need to hurry.

The equation that describes the vehicle's absolute velocity can be derived by comparing formulas (31) and (33). Application of several simple mathematical transformations allows us to obtain the relevant equation. All the transformations have been subsequently presented in such way so that independent tracking of the entire process can be performed.

$$\frac{R}{R_{opp}} = \frac{tg(\alpha)\dfrac{L}{\left(1-\dfrac{v}{cc}\right)}}{tg(\alpha)\dfrac{L}{\left(\dfrac{v}{cc}+1\right)}} = \frac{L}{\left(1-\dfrac{v}{cc}\right)} \cdot \frac{\left(\dfrac{v}{cc}+1\right)}{L} = \frac{\left(\dfrac{v}{cc}+1\right)}{\left(1-\dfrac{v}{cc}\right)} \qquad \frac{R}{R_{opp}} = \frac{\left(\dfrac{v}{cc}+1\right)}{\left(1-\dfrac{v}{cc}\right)}$$

$$\frac{R}{R_{opp}}\left(1-\frac{v}{cc}\right) = \frac{v}{cc}+1$$

$$\frac{R}{R_{opp}} - \frac{R}{R_{opp}} \cdot \frac{v}{cc} = \frac{v}{cc}+1$$

$$\frac{R}{R_{opp}} - 1 = \frac{v}{cc} + \frac{R}{R_{opp}} \cdot \frac{v}{cc}$$

$$\left(\frac{R}{R_{opp}} - 1\right) = \frac{v}{cc}\left(1+\frac{R}{R_{opp}}\right)$$

$$\frac{\left(\dfrac{R}{R_{opp}} - 1\right)}{\left(\dfrac{R}{R_{opp}} + 1\right)} = \frac{v}{cc} \qquad \longleftarrow \qquad cc = c \cdot \cos(\alpha) \quad (24) \qquad c = 2{,}998 \cdot 10^{8}\,\frac{m}{s}$$

$$v_{abs} = c \cdot \cos(\alpha) \cdot \frac{\left(\dfrac{R}{R_{opp}} - 1\right)}{\left(\dfrac{R}{R_{opp}} + 1\right)} \qquad (38)$$

Absolute vehicle velocity. Radius-based method.

"Only those who attempt the absurd will achieve the impossible."

M. C. Escher

2.4 Numerical analysis.

The numerical analysis is based directly on the results of mathematical analysis. The numerical analysis in this section comprises only those problems that are directly associated with determination of the vehicle velocity. Only three equations have been analysed and they are (31), (33) and (38) respectively.

The analysis is composed of two parts. Both differ only in value of the iteration step applied to the above equations. The chosen value is, of course, the vehicle velocity. A rule has been applied during the analysis, that vehicle's acceleration was equal to zero at the time of measurement (analysis performance). The assumed iteration step values were respectively:

velocity iteration step V_{STEP} = 300000 m/s

velocity iteration step V_{STEP} = 300 m/s

The greater iteration step allows for obtaining of 1000 points counted from (v=0m/s) to (v=C)

The smaller iteration step allows for obtaining of 1000 points counted from (v=0 m/s) to (v=300000 m/s), i.e. to the single value of the first (greater) step.

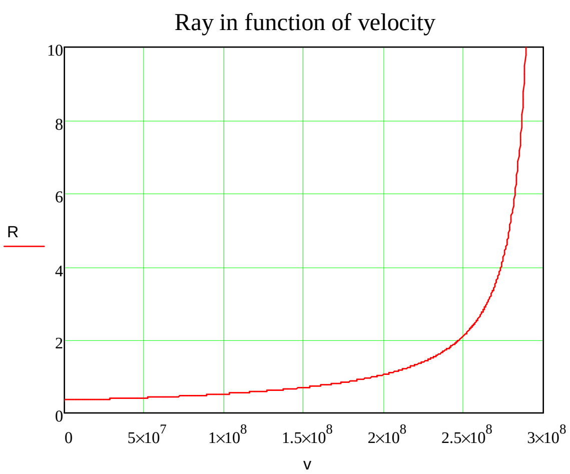
Relevant plots were made based on the results obtained.

The angle assumed for the cones of light is invariably (α=2deg), the measurement distance on-board the vehicle also did not change and it is (L=10m).

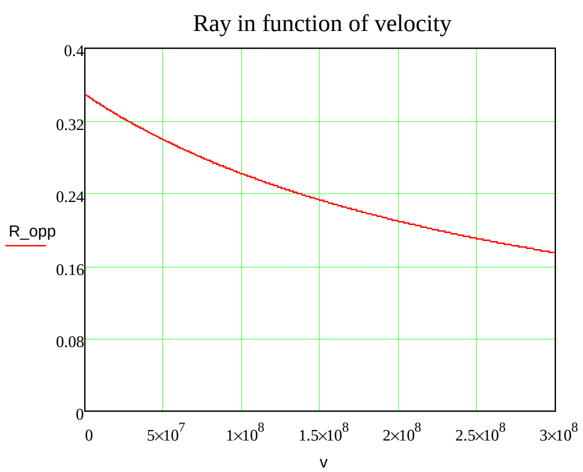
The results of the numerical analysis for the iteration step: V_{STEP} = 300000 m/s

$$R = tg(\alpha)\frac{L}{\left(1-\frac{v}{cc}\right)} \qquad (31)$$

$$R_{opp} = tg(\alpha)\frac{L}{\left(\frac{v}{cc}+1\right)} \qquad (33)$$



Graph 12. Radius (R) as a function of vehicle velocity.



Graph 13. Radius (R_{opp}) as a function of vehicle velocity.

v = (m/s)

	0
0	0
1	$3\cdot10^{5}$
2	$6\cdot10^{5}$
3	$9\cdot10^{5}$
4	$1.2\cdot10^{6}$
5	$1.5\cdot10^{6}$
6	$1.8\cdot10^{6}$
7	$2.1\cdot10^{6}$
8	$2.4\cdot10^{6}$
9	$2.7\cdot10^{6}$
10	$3\cdot10^{6}$
11	$3.3\cdot10^{6}$
12	$3.6\cdot10^{6}$
13	$3.9\cdot10^{6}$
14	$4.2\cdot10^{6}$
15	...

R = (m)

	0
0	0.3492
1	0.3496
2	0.3499
3	0.3503
4	0.3506
5	0.351
6	0.3513
7	0.3517
8	0.352
9	0.3524
10	0.3527
11	0.3531
12	0.3535
13	0.3538
14	0.3542
15	...

R_opp = (m)

	0
0	0.3492
1	0.3489
2	0.3485
3	0.3482
4	0.3478
5	0.3475
6	0.3471
7	0.3468
8	0.3464
9	0.3461
10	0.3457
11	0.3454
12	0.3451
13	0.3447
14	0.3444
15	...

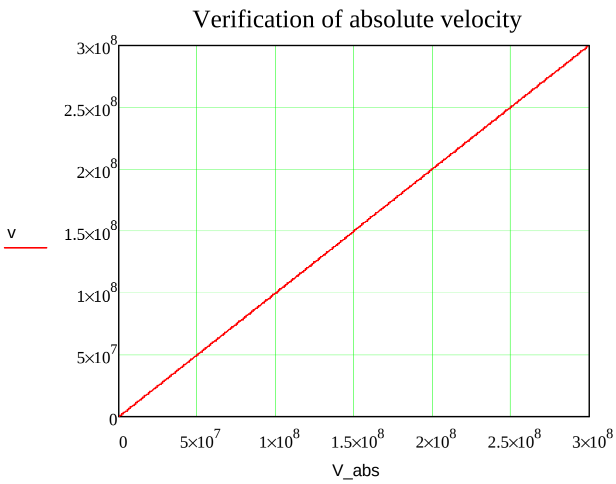
The above presented graphs show how the light spot radius behaves on the measuring target as a function of vehicle velocity. Despite the identical measurement distance for both cases, the created spots behave differently. Depending on the direction of the experiment performed by the astronauts, the spot radius either increases or decreases from the initially identical value. Several first steps of simulation have been presented in numerical form. Relevant numerical values can be compared. Initially, values of radii (R) and (R_{opp}) "depart" from one another slowly. This happens despite fixing of a very high value for the vehicle velocity iteration step.

For the static astronauts, and for us, the vehicle velocity is known. We freely steer the analysis step imposing appropriate velocity on the vehicle. Values of radii (R) and (R_{opp}) were determined theoretically based on equations (31) and (33). We cannot perform any direct measurement as we are not located on-board the vehicle.

The astronauts/voyagers are isolated from the external world. They do not know their vehicle velocity but they can perform a real measurement of the values (R) and (R_{opp}) on the measuring targets. Using (38) equation the voyagers can determine their own absolute velocity. It is worth noting that the angle (α=2deg) was known to the astronauts even before the commencement of their voyage.

$$v_{abs} = c \cdot \cos(\alpha) \cdot \frac{\left(\frac{R}{R_{opp}} - 1\right)}{\left(\frac{R}{R_{opp}} + 1\right)}$$

(38) absolute vehicle velocity



V_abs =

	0
0	0
1	$3 \cdot 10^5$
2	$6 \cdot 10^5$
3	$9 \cdot 10^5$
4	$1.2 \cdot 10^6$
5	$1.5 \cdot 10^6$
6	$1.8 \cdot 10^6$
7	$2.1 \cdot 10^6$
8	$2.4 \cdot 10^6$
9	$2.7 \cdot 10^6$
10	$3 \cdot 10^6$
11	$3.3 \cdot 10^6$
12	$3.6 \cdot 10^6$
13	$3.9 \cdot 10^6$
14	$4.2 \cdot 10^6$
15	...

$\frac{m}{s}$

Graph 14. Calculated vehicle's absolute velocity as a function of imposed velocity. Verification of calculations.

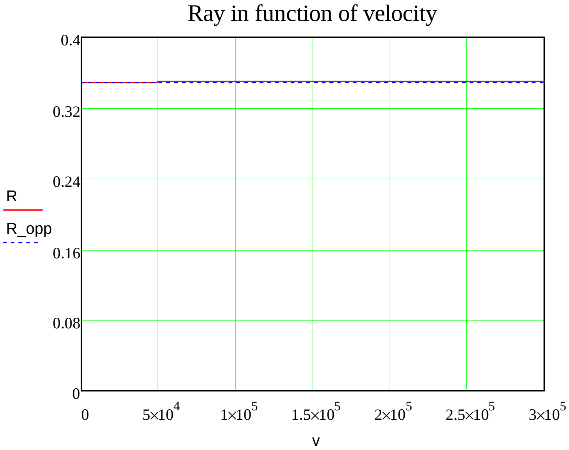
Graph 14. presents the value of the simulated vehicle's absolute velocity as a function of the imposed velocity. The result coincide perfectly. The astronauts/voyagers determine their vehicles velocity. The fact that they are isolated from the external world does not hinder them.

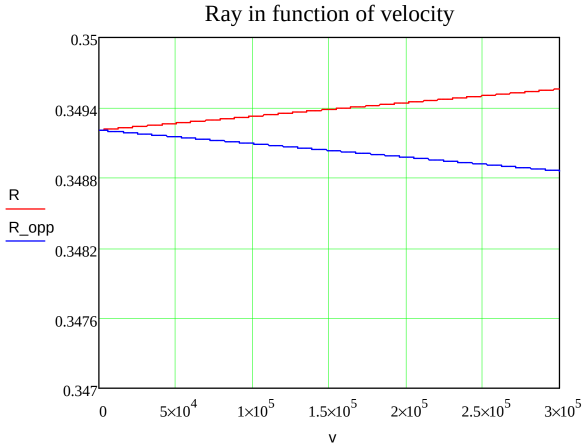
Values of velocities achieved by any spacecraft in the real world are considerably lower than the above presented velocities. It is worth examining the range of small vehicle velocities. The analysis step has been reduced for this purpose. Values of radii (R) and (R_{opp}) have been shown in a single plot. This allows for better comparison of both values.

The results of the numerical analysis for the iteration step: V_{STEP} = 300 m/s

$$R = tg(\alpha)\frac{L}{\left(1-\frac{v}{cc}\right)} \quad (31)$$

$$R_{opp} = tg(\alpha)\frac{L}{\left(\frac{v}{cc}+1\right)} \quad (33)$$





Graph 15. Radii (R) and (R_{opp}) as a function of vehicle velocity. ***Graph 16. Scale of the axis has been enlarged.***

v = (m/s)

	0
0	0
1	300
2	600
3	900
4	$1.2\cdot10^3$
5	$1.5\cdot10^3$
6	$1.8\cdot10^3$
7	$2.1\cdot10^3$
8	$2.4\cdot10^3$
9	$2.7\cdot10^3$
10	$3\cdot10^3$
11	$3.3\cdot10^3$
12	$3.6\cdot10^3$
13	$3.9\cdot10^3$
14	$4.2\cdot10^3$
15	...

R = (m)

	0
0	0.349208
1	0.349208
2	0.349208
3	0.349209
4	0.349209
5	0.349209
6	0.34921
7	0.34921
8	0.34921
9	0.349211
10	0.349211
11	0.349212
12	0.349212
13	0.349212
14	0.349213
15	...

R_opp = (m)

	0
0	0.349208
1	0.349207
2	0.349207
3	0.349207
4	0.349206
5	0.349206
6	0.349206
7	0.349205
8	0.349205
9	0.349205
10	0.349204
11	0.349204
12	0.349203
13	0.349203
14	0.349203
15	...

Graph 15. and Graph 16 are, principally, a single graph The difference consists only in the choice of scale. Strong enlargement of the numerical value on the y-axis of the second graph shows divergence between the plots for radii (R) and (R_{opp}). This difference is visible in the numerical results only at the fifth or sixth decimal place. Such difference can hardly be observed in everyday life but when properly prepared experiment is performed, this should be, however, possible.

2.5 Partial conclusions.

- The passengers of the vehicle on-board of which the optical experiments are being performed are under an illusion. The region of space that they observe is limited by the vehicle's dimensions. This area does not correspond with that region of space, in which real optical phenomena occur.

- The real region of space that is observable on-board the vehicle depends on the vehicle velocity. The cone of light that is observable for the voyagers becomes contracted or extended depending on the direction in which the experiment is performed. The phenomenon that is directly responsible for this is the *"free space loss"*.

- The *"free space loss"* phenomenon belongs to the fundamental laws of physics. It should be admitted that it is indisputable (this must be even accepted). This law is associated with space geometry. The Experiment – cosine C has been based directly on this physical law. It forms a foundation for the entire experiment. It's innovative character has been based on the presentation of the optical version of the *"free space loss"* law as-if in motion.

- Shape of the cones of light observed on-board the moving vehicle is inconsistent with the expected shape. It simply is not intuitive. The voyagers expect that the shape of both cones will be symmetrical. This phenomenon has psychological character. In every day reality relativistic velocities cannot be achieved, therefore, the above described phenomena are imperceptible.

- The vehicle's absolute velocity can be determined by application of the radius-based method (38). This method is independent of time.

- Those assumptions of the Theory of Relativity that refer to impossibility of determination of the vehicle's absolute velocity are wrong! Two different versions of the experiment seem to confirm this conclusion independently.

"Logic will get you from A to B. Imagination will take you everywhere."

Albert Einstein

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